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17. ABSTRACT (MAX. 250 WORDS) Methods of testing, evaluating, and teaching reading in the fourth, fifth and sixth grades are described. Construction and design of experimental tests of variability in reading speed are discussed.

Design was based on the rationale that a meaningful reading-time score directly related to the subject's purpose for reading. While reading speed may be directly expressed in time units alone, attention was focused upon a derived rate of reading score in relation to degree of comprehension and in some cases to a specified purpose for reading. Words-per-minute scoring was not given preference, as eye-movement photography had shown that the focus of attention in rapid reading is upon key words within thought units, suggesting that the act of reading is one of selection of words which advance continuity of ideas. Multiple choice was the most usual technique used for measuring comprehension. Passage content, style, familiarity, structure and sentence complexity were considered significant and amenable to experimental control.

Psychological tension was measured with a Gibson 8 Channel Polygraph, Galvanic skin response, muscle tension, handwriting speed, and legibility of writing were also considered. A significantly greater portion of children showed lower levels of tension in reading tasks than in subsequent recall tasks.

Individual variability indices of the relative adjustment of reading time for the three reading purposes are not different from one intermediate grade level to another. Reading time in seconds or reading rate in words-per-minute, however, does change significantly during this period, if children become more efficient in later grades, butthey do not increase in adjustment of reading speed to specific purposes.

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EXPERIMENTAL DEVELOPMENT OF VARIABILITY IN READING RATE IN GRADES 4, 5, AND 6

Cooperative Research Project No. 1755

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Laboratory for Research in Basic Skills
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University of Wisconsin
Madison, Wisconsin

1965

The research reported herein was supported by the Cooperative Research Program of the Office of Education, U. S. Department of Health, Education, and Welfare.

DEDICATION

The Committee for Research in Basic Skills has endeavored, from its inception in 1949, to relate its research to questions of educational significance. It has sought to pose specific research tasks in broad psychological and curricular contexts, to seek control over relevant task variables, and to use experimental designs and methodologies that permit generalization of its findings to many aspects of school practice.

The Committee for Research in Basic Skills has in the best sense been committed to the spirit and practice of cooperative research. Composed of staff members of diverse backgrounds, interests and talents, it has pursued its research goals in a spirit of mutual understanding and effort. It has extended this operational policy to the research assistants associated with its various projects because of the conviction that their best interests are likewise served by the assumption of mutual responsibilities in the actual conduct of research. Indeed, the contributions of research assistants to such projects have been many and significant, as the minutes of weekly meetings of the Committee will testify.

The founder and guiding spirit of the Committee for Research in Basic Skills was Virgil E. Herrick, whose untimely death in July, 1963, deprived the educational community of a brilliant and indefatigable seeker of improvement in educational theory and practice. It is to his spirit of educational leadership and research that this, the last major research project upon which he worked, is dedicated.

THE COMMITTEE FOR RESEARCH IN BASIC SKILLS
T. L. H.
J. B. M.
G. L. R.

FOREWORD

No aspect of the school curriculum is more basic than the complex of skills and abilities designated as reading. The Committee for Research in Basic Skills, after more than a decade of systematic investigation into handwriting skills, herein reports the first of a projected series of experimental studies into significant aspects of the nature and development of reading. The focus of this study, while specifically upon the efficient adaptation of reading speed to reading purposes, is nonetheless directly related to the continuing concern of the Committee for investigating in depth into those conditions which promote effective learning in school tasks.

This study was made possible only by the cooperation of many agencies and persons. The primary support of the Office of Education is gratefully acknowledged. The Committee is likewise indebted to the stimulating leadership of the Dean of the School of Education, Lindley J. Stiles, and for his action in providing space and sustaining budgetary support for the Laboratory for Research in Basic Skills. The important role of Philip E. Lambert, Director of the Laboratory Schools, in implementing this project is likewise recognized. Especial thanks for technical assistance are due to Professors Chester Harris and Frank Baker of the Department of Educational Psychology, to Professor Leslie McClean, now of Columbia University, to Mrs. Meeter of the Wisconsin Survey Research Laboratory, and to Mr. Reinhold Fischer of the University of Wisconsin Computing Center.

The splendid cooperation of the Madison public schools was most gratifying to the investigators. The encouragement of this project by the Superintendent of Schools, Robert D. Gilberts, by the principals of the many schools involved in the study, and by the teachers with whom we worked was outstanding. Nor will we ever cease to be amazed at the good will, enthusiasm and effort with which the pupils of the Madison public schools entered into the tasks which we set before them. They truly made such a project as this possible.

The research assistants who participated in the many phases of the planning, execution and reporting of this study deserve special recognition: Roger Bennett, Jerry Dempsey, Edith Gifford, Karl Koenke, Ann Lasswell, Carol Lindeman, JoAnn Safrit, and Leona Schnicke. Jacqueline Damgaard showed great ingenuity in cajoling a stubborn computer to accept a complex program, and Saadia Afifi assisted materially in phases of the statistical analysis.

These and many other students helped make the project "go." Yet their efforts and those of the investigators in this complex project were successfully culminated largely because of the coordination provided by our very able executive secretary, Mrs. Diane Davis, who supervised all aspects of the implementation of the entire project. To her, her staff, and to the students who participated in the day-to-day decisions and work of this project we are especially indebted for making this in fact a cooperative venture into educational research.

THE COMMITTEE FOR RESEARCH IN BASIC SKILLS

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Professor of Educational Psychology
and of Curriculum and Instruction

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G. Lawrence Rarick
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Physical Education

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CHAPTER I

NATURE AND SCOPE OF THE STUDY

The Problem

The problem under investigation is essentially two-fold: (1) to examine the effects of an intensive, short-term training program to teach pupils at the fourth grade level to vary their reading speed for given purposes, and (2) to survey the extent to which children in grades 4, 5, and 6 actually vary their reading speeds for different specified purposes. The appropriateness of such a task for children as early as the 4th grade was likewise a major concern of the investigators.

The Rationale of the Study

The Committee for Research in Basic Skills has spent some 15 years in a program of research directed primarily toward fundamental problems of skill learning at the elementary school level in a search for broad curricular generalizations and applications. The focus upon the handwriting problem in particular has resulted in an extensive series of articles and monographs reporting a new experimental approach to the scaling of handwriting samples, an intensive investigation of the role of perceptual models in a basic skill learning task, and the interplay of important motor and physiological variables in a fine motor skill.

Three series of studies of this Committee bear upon the proposed research project. In The Perception of Symbols in Skill Learning, (6) Herrick, Harris, and Rarick presented detailed evidence to show that: (1) children in the intermediate grades--a period when children should have approximated the high point in the development of handwriting skill--did not have a perception of their own handwriting sufficiently clear to enable them to place their samples accurately upon a scale of handwriting quality; (2) few children had clear aspiration models toward which they would like to move in their own handwriting development; and (3) many children displayed clear evidence of motor-speed sets which limited their range of performance. This study raised grave questions about the efficiency and desirability of patterns of handwriting instruction based primarily upon principles of drill, visual reinforcement by an artificial model, and the development of a relatively rigid motor-speed set related to only one level of legibility in handwriting. There is a distinct possibility that higher levels of handwriting quality could be obtained more efficiently and that a more effective relationship could be established between motor performance, handwriting legibility, and the nature of the writing task if more attention were paid to the role of models as directive forces or sets in handwriting instruction; and if the importance of the development of variability rather than rigidity in motor-speed sets were recognized as a realistic objective in handwriting instruction. This study has important implications for all areas of skill development.

A second series of studies on pressure patterns in the handwriting act by Harris and Rarick (4) and Herrick and Otto (7) established that control of point pressure within given levels is more directly related to success in the production of legible handwriting than merely light or heavy pressure *per se*. The implication here is clearly that efficiency in such a skill as handwriting does not seem to be associated with the development of a fixed level of pressure but rather with the ability to control pressure within given limits.

A third series of studies by Otto indicated the presence of similar controls over behavior in the reading act among poor readers. Otto (11) has shown that among good readers in the elementary grades, responsiveness to different types and combinations of audio-visual-kinesthetic reinforcement varies according to grade level and type of reinforcement. The variance, however, was not always in the direction predicted, suggesting that one effect of typical established programs of reading instruction may be to develop perceptual sets in reading that vary from grade to grade but which are little understood at the present time.

These three series of studies in basic skills related to handwriting and reading suggest the importance of the perceptual models which the individual develops as controlling factors in learning and the importance of exploring further those factors which may limit skill behavior. We have theorized that these expectancies and modes of reacting operate as perceptual sets which control behavior to an important degree. As applied to early reading behavior, it appears that one effect of many programs of primary reading instruction is to crystallize a perceptual speed set which permits the pupil, hopefully, to cope with a variety of comprehension demands, particularly those associated with detailed recognition and recall. Since the pupil must, however, be prepared to meet many comprehension contingencies in his reading tasks, he tends to adopt a relatively invariant perceptual speed set which may be quite unrelated to his potential reading speed for well-defined purposes. The theoretical rationale of this investigation is thus that the generalized, limiting perceptual speed set observed in many children may through appropriate training be broken down and replaced by more efficient and variable reading speeds determined by defined purposes for reading and by comprehension tasks specific to the defined purposes.

Operationally, a major objective of this study is the experimental development of variability in reading speed as a function of one's purpose for reading. Adjusting reading speed to one's purpose for reading is widely recognized as a significant and desirable attribute of a good reader. Ideally, the effective reader possesses variable reading speeds that are adaptable to his purpose for reading and to the materials being read. [See, for example, Judd and Buswell (8 :152-6), McKee (9:134), Shores and Husbands (13) and others.] Furthermore, appropriate variability in reading speed is an accepted and highly desirable objective of reading instruction in the intermediate grades. [See DeBoer and Dallmann (3:170-81), McKim (10:404-5), and others.] There is, however, a marked lack of evidence that such variability in reading speed is typically developed and operative among children by the end of the intermediate period. Herculane (5) has shown, for example, that rate of reading for defined but varied purposes is relatively invariant among junior high school pupils and that while the concept of variability in reading speed is tacitly accepted, it is not functional. Blommers (1) has also demonstrated that the correlation is only .30 between reading speed and comprehension when reading for defined purposes, some good comprehenders being fast readers and others being slow readers; and that reading for defined purposes and the nature of the materials read may affect rate of reading. [See also Carlson (2) and Shores (12).] Such variability in reading speed as does exist apparently is found only among good comprehenders, although Smith found that neither good nor poor readers differentiated their method of attack according to their purpose for reading (14).

The research cited, however, does not deal with the experimental development and manipulation of variable reading speeds in children but merely reports the effects of existing programs of reading instruction upon the speed at which children tend to read. Nevertheless, the literature reflects various assumptions concerning the speed function in programs of reading instruction: (1) that faster readers in general comprehend more; therefore, the faster a child can read the more he comprehends, (2) that most individuals have "grooved" their reading at a level a good deal lower than is possible for them to achieve; therefore, their reading speed level should be increased through appropriate pacing or forcing devices, or (3) that no clear-cut relationship between speed and comprehension in reading exists; therefore, speed of reading can be understood only in relation to the purpose for reading, the nature of the material being read, and the limits set by the social conditions within which the reading is done. Suffice it to say that little attention has been paid to the matter of selective reading speeds at the elementary school level.

There is, moreover, no adequate evidence in the literature either of the extent to which variable reading speeds may be developed in children, the conditions under which variable reading speeds may be achieved, or the possible stress or tension factors which may be associated with their development. For these reasons as well as because of the critical importance of variability in reading speed in the functioning of an effective reader and the possibility of its early development in the later elementary school grades, the present research was undertaken.

Nature and Limits of the Research Task

The two-fold task of measuring variability in reading speed and of devising materials for its development required a series of decisions which served to define the nature and limits of this investigation. The more general of these decisions will be briefly noted.

Control over Reading Task Variables

Definition of the reading task was sought by stating specific purposes for reading. This study is limited in its testing and training aspects to three such purposes: Reading for the Main Idea, Reading for the Sequence of Ideas, and Reading To Find a Specific Fact. A major assumption of the study is that the reading tasks defined by these purposes are sufficiently different to permit correspondingly different reading speeds.

Observing the principle advanced by Blommers that a reading speed score should represent speed of comprehension, control over comprehension was attained by requiring the pupil to read, and re-read if necessary, until he achieved the comprehension task defined by the purpose for reading. Reading time scores reported in this study, unless otherwise noted, indicate the amount of time in seconds taken to successfully comprehend the defined reading purpose.

Control over Materials Variables

An examination of published rate of reading tests indicated that control over materials variables which might affect rate of reading was meager if not non-existent. An attempt was therefore made to build an experimental test and corresponding training materials which would allow the control and/or manipulation of certain aspects of materials thought likely to influence reading speed. The chief materials variables over which control was sought were:

a. Passage length
b. Passage difficulty, including vocabulary and sentence complexity
c. Passage style
d. Paragraph organization
e. Passage content

The testing and training materials were developed for use in all phases of the study.

Control over Population Variables

The sample for this investigation was drawn from the public schools of Madison, Wisconsin, a city of well over 100,000 inhabitants. It may be considered representative educationally of cities of comparable size and upper middle class socio-economic level throughout the nation. In both the survey in grades 4, 5 and 6 and the 4th grade training phases of the study, the selection of subjects was limited by two major considerations: (1) that subjects should be reading at or above grade level on the basis of October STEP scores and teacher judgment prior to the experimental spring testing and training programs, and (2) that an equal number of boys and girls be included in all phases of the testing and training programs to permit determination of possible sex differences. Within these limits, all assignments to testing and training sequences were made randomly.

Cooperation of the Madison Public Schools and the University of Wisconsin Survey Research Laboratory was enlisted to insure, within the limits described above, that the survey sample be representative of the geographical distribution and the family economic and educational levels of the population of the city of Madison. The experimental training portion of the study was for logistic reasons limited to one geographic area of the city in which there was resonable homogeneity in the economic, cultural, and educational level of its families.

Other Procedural Steps

The chief problem in the initial testing was to devise appropriate test materials and conditions for test administration that would enable the experimenters to identify, if possible, the major effects and interactions of such factors as type of training, order of training, reading purpose, various materials components, and sex upon the time taken by 4th grade subjects to read to full comprehension.

The results of the first phase of the investigation were used as a guide for building training materials and for the formulation of experimental training programs. Five simultaneous experimental training programs of 2 weeks' duration were devised in connection with which variability in reading time was periodically measured. Laboratory procedures were likewise used in this phase of the investigation to explore evidences of tension related to the task of reading for different purposes as indicated by the pupils' galvanic skin response and by the muscle-action-potential activity of a selected muscle group. During pre and post tests continuous records were made of the GSR and MAP activity to permit analyses of responses associated with reading test directions, reading test selections, and finding appropriate answers.

Another aspect of the training phase was to examine certain characteristics of the child's perception of the reading task. A modified level of aspiration task was set by asking each subject, knowing how fast he had last read for a given purpose, to predict how fast he would next read a selection for the same purpose. Subjects were also asked to indicate at the end of each daily training period how well they liked their work, how much they felt they were varying their rate of reading for different purposes, and how well they were able to predict their rate of reading for each of the assigned purposes.

Major Hypotheses of the Study

The major hypotheses of the study are:

1. Children in the intermediate grades have a relatively invariant, generalized speed set in reading.
2. Children as early as the 4th grade may, by engaging in appropriate and meaningful reading tasks, learn to vary their reading speeds for different specified purposes.
3. Children in the 4th grade will, after training to adjust their speed of reading to different purposes, display less tension as evidenced by increased stability in the

pattern of such physiological measures as the galvanic skin response and muscle action potentials.

4. Children in the 4th grade will show improvement in their perception of the reading task by learning to predict their speed of reading for different purposes more realistically (accurately) after training than before training.

The Plan of the Report

The report presents in Chapter II, in connection with a review of selected aspects of the literature, a discussion of an experimental test of variability in reading speed, the results of its administration, and the implications of these results for further training and testing. Chapters III and IV are devoted to an examination of curricular issues involved in the training aspects of the study, and to a description of the nature, and results of specific training programs developed to produce variability in reading speed. Evidence with respect to children's perception of the experimental training tasks is given in Chapter V, while data on tensional and anxiety correlates of the experimental reading task are reported in Chapter VI. In Chapter VII the design and results of a survey of reading speed variability in pupils in grades 4, 5 and 6 are given. The final chapter presents the major conclusions of the investigation and a discussion of the implications of the findings.

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CHAPTER II

THE CONSTRUCTION, DESIGN AND RESULTS OF AN EXPERIMENTAL TEST OF VARIABILITY IN READING SPEED

From the inception of this project it was realized that many decisions would have to be made relative to the control of test and materials variables. An extended period of study and discussion of many facets of the research literature, of existing reading tests and materials, and of logical and psychological considerations preceded the actual construction of the experimental test described in this chapter and the materials described in Chapter III. Since these deliberations determined the specific characteristics of the testing and training materials prepared for this project, the background for decision-making will be presented first in this chapter. Succeeding sections of the chapter will describe the actual construction of the experimental test, the experimental design and method of analysis, the testing procedures, and the results of the initial experimental testing.

Basic Considerations

The Research Task

The rationale of this investigation required that a meaningful reading time score directly related to the subject's purpose for reading be defined. Such a score, it was felt, could not be obtained save with respect to demonstrated comprehension of the material read for a given purpose. Control over the purpose-comprehension aspects of the reading task therefore appeared necessary to permit an examination of the dependent variable of reading time.

The Reading Rate-Comprehension Relationship

While reading speed may be directly expressed in time units alone, the attention of investigators has usually been focused upon a derived rate of reading score (as, for example, the number of words read in a given unit of time) in relation to degree of comprehension and in some cases to a specified purpose for reading. Such a derived score has a certain utility in supplying a common speed referent for passages of different lengths.

The results of some two-dozen research studies of the rate-comprehension relationship differ greatly, varying from those which indicate no correlation to those which indicate a significantly positive or negative relationship between reading rate and reading comprehension. [See, for example, representative studies by Flanagan (6), Tinker (24), Stroud (22), Blommers (1), Stroud and Henderson (23), Shores and Husband (19), Letson (16), Koester (13), Troxel (25), and Braam (2).] An examination of such studies shows that the discrepant results obtained may to a large degree be due to differences in ways of measuring rate and comprehension and to the presence or absence of control over the purposes and materials for reading. As Carillo and Sheldon (4) have noted, if subjects have a flexible reading rate, then rate and comprehension will vary together and produce a high correlation; but the presence of subjects with an inflexible reading rate in a given sample will tend to lower the correlation between reading rate and comprehension for studies in which degree of comprehension is allowed to vary.

The Problem of Measuring Reading Rate

The Unit of Measurement. The most common unit for measuring reading rate is the word. When the word is the unit, reading rate is computed as a ratio of words to time and is usually reported as a words-per-minute score. It should be noted, however, that there is a trend away from the use of this type of score in recent standardized tests in favor of a speed of comprehension score expressed in percentile ranks or standard scores.

The use of the word as the unit for measuring rate of reading poses a number of problems. Its use appears to assume that each word is for counting purposes the equivalent of every other word. Thus in a given passage the word an would receive the same weight in calculating reading rate as, for example, the cognate hippopotamus. The use of the word as the unit of measurement further implies that the word is the functional unit of perception in reading whereas research shows that fluent, fast readers use word groups or phrases as the basic recognition unit. Eye-movement photography, furthermore, has shown that the focus of attention in fluent, rapid reading is upon key words within thought units, suggesting that the act of reading is one of selective attention to certain phrase words which advance the continuity of ideas in reading. It should also be noted that as one attains higher rates of reading, the reading process becomes more and more selective in terms of the words and word-groups upon which attention is focused--so much so that in the very high speed reading range, as Stauffer (21) has pointed out, the word as a unit becomes totally inadequate to represent the speed function in reading. The word is also an unprecise unit of measurement in those cases in which re-reading is permitted or encouraged.

Concerns such as these have led to the search for other units of measurement. It has been argued, for example, that a basis for the measurement of reading rate should be found that reflects the key phrase units being read or tested. The search for such a unit which can be objectively measured has been neither consistent nor conspicuously successful, especially in the objective identification of the "phrase." Early in this study, an examination was made of two sets of materials of about the same length and written at the 4th grade level in an attempt to objectively identify significant phrase units as a basis for calculating rate of reading. Each passage was analyzed upon each of the following bases for determining phrases:

1. Subject-verb units only, including verbals. (Direction: Mark after each verb, verb phrase or verbal, and at the end of sentence.)
2. Subjects and verb units only. (Direction: Mark

between each subject and verb, and at end of sentence.)

3. All nouns, pronouns and verbs, including verbals. (Direction: Mark after each such unit and at end of sentence.)

The results of this analysis are given in Table 1.

TABLE 1

RESULTS OF FOUR DIFFERENT UNITS OF MEASUREMENT FOR CALCULATING READING RATE AS APPLIED TO TWO READING PASSAGES

	Total Words		Phrase Units					
			Subject-Verb		Subject and Verb		Nouns, Pronouns and Verbs	
	N	%	N	%	N	%	N	%
Passage 1	115		25	22	41	35	54	44
Passage 2	104		26	25	42	40	50	48
Difference Between Passage 1 and 2		10		3		5		4

It will be noted that the number of units and the proportion of these units to the number of words in each passage depends upon the scope of the defined unit. Thus, proportionately, the noun-pronoun-verb count includes slightly less than one-half of the words in each passage, the subject and verb count from about one-third to two-fifths, and the subject-verb count about one-fourth of that number. The proportional differences between passages in each case are slight, the greatest difference (10%) being in passage length. This analysis suggests, therefore, that the adoption of one of these alternative units of measurement would not proportionally affect a rate score in a significant way, although it would alter the estimate of rate in an absolute sense.

A question may also be raised as to the correspondence of the unit of rate with the unit of comprehension in reading if the phrase "rate of comprehension" is to have any real meaning. This appears to be an important consideration especially as different purposes for reading may dictate markedly different units of perception from which inferences about comprehension are made. Hopefully, objective ways of identifying and counting significant ideational units which correspond to the appropriate comprehension units may be found and ultimately used as a standard basis for the calculation and interpretation of rate of reading. This research group does not feel that it has thus far attained this goal. Therefore, in the light of the very real difficulties in the interpretation of rate of reading scores, preference is given for the most part in the current research project to working with reading time scores rather than with converted words-per-minute scores for the assigned tasks.

Methods of Obtaining the Time Sample. Time for reading may be recorded by eye-movement photography for short samples under somewhat artificial conditions but with great fidelity. The more usual method in standardized group testing is to set either one or more intervals for marking reading progress or to stipulate an arbitrary time limit for reading. A less usual method, such as that employed by Blommers (1), is to have each subject mark his own time after completion of the reading task.

The Base for Measuring Speed in Reading. The base for measuring speed in reading may be simply the number of words read in one or more passages, or the combined working time for reading and asnwering questions upon the material read, often called speed of comprehension. In the former case, as in the Iowa Silent Reading Test, separate scores are obtained for rate and for comprehension, presumably without opportunity for re-reading. In the latter case, as in the Davis Reading Test or the simpler reading speed section of the Gates Reading Survey, passages may be read and re-read as responses to questions are being formulated. The obvious problems posed by either alternative suggest that investigation of reading time versus response time be made in the present study.

The Measurement of Comprehension in Rate of Reading Tasks

Aspects of Comprehension to be Measured. The typical test of reading rate measures two aspects of meaning: (1) general meaning, either explicit or implied, as in items calling for the main idea, conclusions or inferences drawn from the selection, or appropriate selection of titles, and (2) specific meaning, as in items requiring identification of specific word meanings or specific factual details of a passage.[1]

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[1] See for example relevant sections of the Iowa Silent Reading Test, Traxler Reading Test, or the Diagnostic Reading Test. Certain tests, however, such as the Michigan

Inasmuch as typical practice introduces more than one type and/or level of comprehension, questions of selection and emphasis of the appropriate aspects of comprehension are introduced. Examination of the comprehension items in typical rate of reading tests shows that emphasis upon specific meaning aspects of comprehension is usually much greater than upon those of more general meaning as indicated by the relative number of items dealing with each aspect. This is no doubt related to the greater number of specific measurable aspects per passage, and to the failure of most rate of reading tests to control the specific purpose for reading in such a way as to define more rigorously the type of comprehension to be measured.

Items for measuring the comprehension of rate of reading selections are typically highly selective and usually reflect only a fraction of the total number of ideas which might be used for such a purpose. A question is thus raised about the appropriateness of adult judgments in determining the nature and scope of the comprehension items to which the reader is to respond. The question here is not about the right of the test maker to determine the kind of response desired; it is rather the question of the scope of the response items to which the reader should be exposed regardless of the specific response desired. In other

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Speed of Reading, the Minnesota Speed of Reading, and the speed section of the Gates Reading Survey, attempt to measure a simple and more uniform aspect of contextual comprehension on a series of uniformly easy reading passages.

words, should there be some correspondence between the nature and range of response units represented in the comprehension test on a speed of reading task and the number and nature of ideas represented in the selection? This appears to be a most important consideration in relation to the testing of variability in reading time.

Techniques for Measuring Comprehension. The most usual technique for measuring comprehension in determining reading speed is the multiple-choice question. The basic problems in the use of this technique for this purpose are in the selection of comprehension units to be measured and in the development of appropriate alternatives for a specific comprehension aspect.

Typical practice in the measurement of reading speed involves separate measures of time and comprehension either reported independently or combined in some index to relate reading speed to the degree of comprehension obtained.[1] In other words, degree of comprehension is usually allowed to vary, the unique exception to this practice being the experimental test developed by Blommers (1) in which reading speed was defined as the time taken to read to comprehend the answer to a given question. Blommers argues with considerable force that one of the uncontrolled variables which accounts in part for the discrepancy in results noted among tests of reading rate is degree of comprehension. Thus, a defined degree of control over the comprehension in the task became a major concern of this investigation.

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[1] See for example, the speed, comprehension and accuracy scores obtainable for the Gates Reading Survey; the level of comprehension and rate of comprehension scores obtainable from the Davis Reading Test; and the adjusted "effective reading rate" employed by Braam (2) and others in which rate is multiplied by the percent of comprehension.

The Role of Purpose in Relation to the Measurement of Reading Time and Comprehension. The case for the control of purpose as well as comprehension in measuring reading time has also been advanced succinctly by Blommers (1). He noted in effect that unless purpose as well as comprehension is controlled, the reader will not make effective adaptations in his speed of reading even though he may be capable of so doing. He reported that when purpose was defined and comprehension specified as attainment of the purpose for reading, good comprehenders tended to vary their reading speed according to the nature and difficulty of the task, although poor comprehenders did not. Since the correlation between reading rate and comprehension was low under these conditions, Blommers' findings suggest that one cannot necessarily infer reading rate from a knowledge of comprehension, nor vice versa.

Other evidence that reading purpose may affect reading speed and comprehension is offered by C. T. Gray (8), Judd and Buswell (12), Hulten (11), Shores (18), Laycock (14), Letsen (16) and Troxel (25). Koester (13) found likewise that although 6th grade pupils tended to manifest rigidity of reading rate irrespective of purpose, there was some evidence that purpose affected rate strategy since pupils reading rapidly for one purpose did not necessarily read rapidly for another purpose.

The trend in recent tests and experimentation to specify either a general or specific purpose for reading presumably invites the reader to adopt a set which will enable him to go about the comprehension task efficiently. Since this was a basic concern of this investigation, attention was likewise given to the definition of purpose for reading.

Characteristics of Materials

Passage Content and Style. The speed-comprehension relationship has been examined with respect to many types of content embracing the fields of literature, social studies, science and mathematics.[1] One concern of investigators, exemplified by the research in the reading of science by Shores (18), has been to demonstrate that conclusions about speed of reading based upon tests of one type of content such as literary materials do not necessarily hold for the speed of reading scientific materials. It has seemed reasonable therefore to give some consideration, especially in the training aspects of this investigation, to the type of content used.

Closely related to the passage content, of course, is the attribute of style, particularly the contrast of expository and narrative styles. While Burk (3) experimented with several variations of style for literary materials alone, there appear to be no reported studies of the effect of expository versus narrative style upon reading speed under suitably controlled conditions.

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[1] See representative studies in poetry and prose by Flanagan (5), in social studies by Henderson (9), in mathematics by Troxel (25), and in science by Koester (13).

Passage Familiarity and Difficulty. Braam (2) concluded that when general purpose for reading was held constant among high school seniors, familiarity with the content was more highly correlated with reading speed than was reading difficulty of passages.

The latter factor, reading difficulty, has in research into the reading speed-comprehension relationship, typically been controlled in some fashion either by informal means such as vocabulary control [Siebert (20)] or by the application of one or more readability formulae, as by Morse (17), Herculane (10), and Letson (15).

Passage Structure and Sentence Complexity. Other than the early work by Gilliland (7), there does not appear to be evidence of an attempt to control paragraph organization in studies of the speed-comprehension relationship. Sentence complexity was, however, varied by Burk (3) who secured evidence that the fastest rate was obtained on passages with long complex sentences, but other experimenters do not appear to have systematically explored the effect of sentence complexity upon reading rate. In the present investigation, both of these factors were considered of possible significance and amenable to experimental control.

Construction and Administration of the Experimental Test

General Characteristics

From the foregoing considerations it was felt that available tests were not suitable for the purposes of this project but that an experimental test would have to be constructed. It was felt that the experimental test should, among other things, possess the following characteristics:

1. The test should define and control two or more specific purposes for reading which could be systematically varied.
2. The test should define the comprehension task in such a way that it would be relevant to and measure the attainment of the specific purpose; and that the range of items to which the reader would respond should represent the major ideational units of the passage read.
3. The test should seek to control within reasonable limits a variety of characteristics of materials. The specific materials variables over which control was sought in the test passages were:
    a. Passage length
    b. Passage difficulty, including vocabulary and sentence complexity
    c. Passage style
    d. Paragraph organization
    e. Passage content

4. The test should be administered by trained examiners under conditions such that:
    a. Preliminary orientation to the nature of the reading purpose would be given.
    b. The test directions would be clear to the reader.
    c. Accurate individual reading and response times would be secured.
    d. The subject would receive immediate confirmation of his success or failure on a given trial.
    e. Provisions would be made for timed re-reading until the completion of a successful trial.

Specific Characteristics of the Experimental Test

Purpose for Reading. Two purposes for reading were selected for the experimental test: (1) Reading for the Main Idea, and (2) Reading for the Sequence of Ideas. It was felt that these two purposes were sufficiently different as to elicit in a flexible reader a more rapid speed set for the former purpose than for the latter. The purpose of Reading for the Sequence of Ideas was likewise considered to be a more difficult and demanding task than the mere identification or recall of specific details in a passage, for the former required the proper ordering of details as well.

The decision to work with these two purposes directly affected the construction of the test passages and the comprehension task. For experimental purposes it was desirable that a given test passage might be read for either of these purposes. This led to the decision that each test paragraph should contain a clear-cut main idea and an identifiable sequence of events or ideas. Furthermore these purposes defined the alternative comprehension tasks of a given passage as either one of identifying the main idea of a paragraph or of ordering those ideas which led to or followed from the main idea.

The Comprehension Task. The basic concern of the research group that there be some correspondence between the response units upon which comprehension was secured and those in the passage upon which speed was measured has been previously noted. The rationale for this position was that the reader should have access to the full scope of such units in making a selection of the appropriate main idea or in determining the proper ordering of ideas. This principle is usually not followed in most objective-type test items which are highly selective and frequently involve the use of distractors.

In this case, the comprehension unit selected as response item on the answer sheets was neither the word nor the phrase, but the sentence. The comprehension items in the experimental test thus consisted of a random ordering of restatements of each sentence in a paragraph. The restatements were often abbreviated in form. In Reading for the Main Idea, subjects simply marked the appropriate sentence. In Reading for the Sequence of Ideas, the sentence containing the main idea was clearly labelled, but subjects were required to number in correct order the other randomly ordered sentences. In this way the comprehension task was specifically designed to measure the type of comprehension dictated solely by the purpose for which the passage was read, and not other extraneous purposes.

A final decision concerning the comprehension task was that full comprehension of the defined purpose for reading be set as the criterion level of comprehension. For this purpose, as many as five separately timed trials were permitted for re-reading until the correct answer as defined by the reading purpose was attained. It was felt that this policy would yield a more valid reading time score through control of the comprehension variable than by accepting different levels of comprehension of the reading task. Indeed, since a primary interest in the experimental test was to examine variability in reading time across purposes and selections, it was imperative that a known and constant level of comprehension be established if possible for each selection read.

Characteristics of Materials. A preliminary examination of available curricular materials at the 4th grade level for which the initial use of the experimental test was designed revealed a host of complications in the search for reasonably comparable passages:

1. Great variance in content--fiction, poetry, drama, social studies, science, mathematics, etc.
2. Different styles of writing--narrative, expository, and a blend of narrative-expository style (expository content written in a narrative style).

3. Marked differences in paragraph organization--deductive, inductive and transitional; tight versus loose structure.
4. Great differences in passage difficulty--vocabulary, sentence length and complexity, abstractness and density of ideas, etc.
5. Differences in passage length.

After an extended period of examination and discussion of available materials, the decision was made that the materials for the experimental test should be written according to defined specifications to secure a reasonable degree of control over such characteristics as those noted above. Accordingly, the following specifications were developed, tried out, and adopted for the experimental test:

1. Each passage should consist of 132 words, divided into two paragraphs of 66 words each.
2. Each paragraph should consist of 6 sentences, each averaging 11 words in length, and with a range of from 7 to 14 words to provide some sentence variety.
3. Each paragraph should contain one sentence containing the main idea. This should be a definite topic sentence.
    a. In deductive paragraphs, this should appear in the first sentence.
    b. In inductive paragraphs, this should appear in the last sentence.

4. Each paragraph should contain five supporting, sequentially ordered sentence-ideas in the remaining sentences to provide an appropriate sequence of ideas for testing.
5. Simple passages should keep the usual subject-verb order, except for the proviso that each paragraph contain two examples only of the following type of sentence complexity complications: relative and subordinate clauses; participial phrases; infinitive phrases separated from the main verb; and inverted subject-verb order.
6. Complex passages should contain one of the above complicating factors in each sentence of each paragraph.
7. No restrictions should be placed within the limits of sentence length, upon other possible complicating factors such as compound verbs and subjects; articles, adjectives, and adverbs, either singly or in clusters; and prepositional phrases.

Through these specifications, controls were placed upon the experimental test materials with regard to equivalent passage length and paragraph length; two types of paragraph structure, deductive and inductive; sequential ordering of sentence-ideas; and two degrees of sentence complexity. It should be noted that passage length was to a great extent limited by the somewhat demanding nature of the comprehension task in Reading for the Sequence of Ideas.

Specification of equivalent passage length, number of sentences and range of length of sentences also contributed to control of the difficulty level of the passages. Further adjustment of the vocabulary of passages showed, together with these factors, that the experimental test was well within the comprehension of children reading at the 4th grade level according to the Dale-Chall formula.[1] While the internal sentence adjustments made to vary sentence complexity did not significantly affect the estimates of difficulty by the Dale-Chall reading formula, the two levels of sentence complexity were retained as experimental variables to study their possible effect upon speed of reading.

The two remaining considerations which directly affected the development of the experimental test materials were those of passage content and passage style. Materials in three subject matter areas were believed to be reasonably comparable for test purposes: literature, social studies and science. A search was made for test content that was judged to be novel and of interest to pupils at the 4th grade level. Further, since it seemed possible to develop and study within common structural limits two definitely contrasting styles of writing which might affect reading speed, narrative fiction and expository non-fiction, it was decided to include these variables in the experimental test. Indeed, it was considered possible at an early point in the discussion of this problem that the clarity of organization of expository style might produce faster speed of comprehension scores than those for narrative style.

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[1] In addition, all words in a passage which it was thought might create a meaning difficulty and thus affect speed of reading were defined for the pupils as a part of the directions for reading a passage.

Test passages meeting the specifications and attributes thus described were constructed, plus three additional passages for training purposes, to permit the manipulation of the indicated dimensions of each of the following four variables:

1. Purpose: Reading for Main Ideas versus Reading for Sequence of Ideas.
2. Sentence Complexity: Simple Sentence Structure versus Complex Sentence Structure.
3. Paragraph Structure: Inductive Development of the Main Idea versus Deductive Development of the Main Idea.
4. Passage Style: Narrative versus Expository.

Examples of a test passage, directions for reading and sample answer sheet are shown on the following pages.

Training in the Administration of the Experimental Test. Provisions were also made for the training of examiners in the administration of the experimental test. Detailed directions were prepared for helping children understand the purposes for which they were to read and for administering, timing and scoring the experimental test. (See Appendix A.) Among other things, examiners were trained to use stop watches in timing reading and response time, to score responses immediately upon the completion of a passage, and to transfer right responses only to a new answer sheet before asking the pupil to re-read. The latter step

SAMPLE

Seq/ F/SI

The selection on the next page is about

A Night Adventure

You are to read this selection once for this purpose: to find the order of happenings or ideas.

When you are through reading the selection once, you should raise your hand. Then you will be shown a list of sentences telling about the selection. These sentences will be in a mixed-up order. The main ideas will be marked for you. You will be asked to find the sentences that go with each main idea and number them in the right order.

Be sure you know these words before you start to read:

sheriff--policeman

back-firing--loud noise sometimes made by cars

worried--felt uneasy

Remember, you are to read the selection once,

--to find out the order of happenings or ideas.

Wait until you are told to start reading.

SAMPLE

F/SI

Sheriff Jones stopped his car one night near an old barn. He sat quietly and listened for several minutes. The sheriff wondered if he really had heard some gun-shots. He could see a light in the window of the barn. Slowly he took out his own gun and got out of his police car. The sheriff wanted to know the meaning of the sounds he heard.

The sheriff walked very quietly toward the old barn. Now he was sure that he heard the sound of voices, too. Suddenly he heard loud sounds like many more gun-shots. He looked through the window and saw two boys in an old car. The gun-shots were just the sound of an old car back-firing. Sheriff Jones found out what made the sounds in the old barn.

As soon as you finish reading once, raise your hand. Do not re-read.

You will be told when to go ahead to the next page.

SAMPLE
F/SI

Seq/

Follow these directions without looking back at the selection:

The sentences below tell about what you have just read.

The sentences are in a mixed-up order. You are to put them in the right order.

1. Read the sentence below marked First Main Idea.
2. Put the five sentences under this main idea in the right order as they happened. Number the right order 1, 2, 3, 4, 5.

First Main Idea: Sheriff Jones wanted to know about the sounds.

__4__ He wondered if he heard shots.

__3__ He sat and listened.

__[illegible]__ He saw a light in the barn window.

__1__ He stopped his car.

__5__ The sheriff took out his gun.

3. Read the sentence below marked Second Main Idea.
4. Put the five sentences under this main idea in the right order as they happened. Number the right order 1, 2, 3, 4, 5.

Second Main Idea: The sheriff found out what made the noises.

_____ He heard voices.

_____ He looked through a window.

_____ A car made the loud noises.

_____ The sheriff went to the barn.

_____ The sheriff heard more loud noises.

Raise your hand when you finish.

was taken to give pupils credit for partial success in the search for the correct identification and ordering of ideas rather than to possibly confuse them by adopting an all or none basis for scoring.

The Design of the Study

Several meetings of the research group were spent, with the help of Professor Chester Harris as consultant, in exploring the question of how to obtain the maximum amount of relevant data from the complex set of variables identified for study. Critical questions were raised by the consultant concerning the practice effects of taking tests, especially the effects of the presence or absence of specific test training and the effects of different sequences of training. Accordingly, it was decided: (1) to minimize test practice effects by administering one test passage during one week and a second test passage one week later; (2) to set up two types of training groups, one to receive specific test training, the other not; (3) to include two sequences of training purposes across weeks within each of the two groups; and (4) to randomly assign subjects to the appropriate training and testing conditions.

Four basic test passages were constructed which incorporated the four reading task variables of purpose, style, paragraph organization, and sentence complexity, each of which had two dimensions. By manipulating these variables it was possible to prepare different versions of a narrative or expository selection of the same length with either simple or complex sentence construction and an inductive or deductive pattern of paragraph organization, to be read for either the main idea or for the sequence of ideas. These variables also determined 16 combinations of testing conditions for a given passage to which pupils might be assigned:

	Purpose	Style	Paragraph Organization	Sentence Complexity
1.	Main Idea	Narrative	Deductive	Simple
2.	Main Idea	Narrative	Deductive	Complex
3.	Main Idea	Narrative	Inductive	Simple
4.	Main Idea	Narrative	Inductive	Complex
5.	Main Idea	Expository	Deductive	Simple
6.	Main Idea	Expository	Deductive	Complex
7.	Main Idea	Expository	Inductive	Simple
8.	Main Idea	Expository	Inductive	Complex
9.	Sequence	Narrative	Deductive	Simple
10.	Sequence	Narrative	Deductive	Complex
11.	Sequence	Narrative	Inductive	Simple
12.	Sequence	Narrative	Inductive	Complex
13.	Sequence	Expository	Deductive	Simple
14.	Sequence	Expository	Deductive	Complex
15.	Sequence	Expository	Inductive	Simple
16.	Sequence	Expository	Inductive	Complex

The two training groups identified consisted of a Test Training group which was given specific training on a sample test before taking the experimental test each of the two weeks, and a Verbal Cues group which was given only a brief introduction to and a cursory examination of the sample test prior to the experimental testing each week. Half of each of these groups followed one of two sequences of training purpose:

		Week I		Week II	
Training Group	N	Training Purpose	Testing Conditions	Training Purpose	Testing Conditions
Test Training	64	Main Idea	→16	Sequence	→16
Test Training	64	Sequence	→16	Main Idea	→16
Verbal Cues	64	Main Idea	→16	Sequence	→16
Verbal Cues	64	Sequence	→16	Main Idea	→16

The subjects for the experimental testing were drawn with very few exceptions[1] from four west side Madison Public Schools, and represented an upper middle class culture of reasonable homogeneity. A total of 256 4th grade subjects, including a equal number of boys and girls, was identified. The criterion measure employed in selection was achievement at or above the 50th percentile according to national norms on the reading comprehension portion of the STEP test administered by the schools 6 months before the date of the experimental testing. Additional confirmation of satisfactory 4th grade reading achievement was also sought from teachers for pupils at or near the 50th percentile.

One hundred twenty-eight boys and 128 girls were randomly assigned by sex to one of two groups, one group (Test Training) experiencing a trial test run, the other group (Verbal Cues) receiving only verbal information on the nature of the test to be taken, and a brief examination on the test itself. These two groups were further randomly subdivided into two groups, the one stressing reading for the main idea, the other focusing attention upon reading for the sequence of events. For testing purposes the 256 subjects were randomly assigned equally by sex to the previously described groups, sequences and testing conditions so that four subjects-two boys and two girls--comprised the basic cells upon which the analysis was run. Thus the influence of type of training, training purpose, test purpose, paragraph style, paragraph organization, sentence complexity, and sex upon reading performance could be determined. A 2^7 factorial design was used as the primary statistical method in the analysis of the data. Separate variance analyses were run for Week 1 and Week 2.

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[1] Seventeen subjects were taken from two additional Madison Public Schools to meet specifications of the design.

Originally it was planned to use reading time in seconds to the criterion of complete comprehension as raw scores for analysis. However, 62, or 24 percent of the 256 children, failed to achieve full comprehension in five trials. Time scores were, therefore, converted to stanine values and failures were assigned to stanines 1 and 2 on the basis of their relative speed. The assumption here was that these subjects should not receive as high reading speed scores as those who comprehended the task. Except for this proviso, the scores for the subjects were arranged from slowest to fastest times and placed in the appropriate stanines 3-9. Stanine scores were used in all statistical analyses of the results of the experimental test.

Sixteen trained examiners working in pairs administered the tests to two subjects at a time in the schools in the spring of 1963.

The first week testing sessions were preceded by a brief lesson to clarify what was meant by Reading for the Main Idea or Reading for the Sequence of Ideas. At the conclusion of the experimental testing, each subject was also asked to react to a simplified inventory intended to obtain his perception of the test materials and the tasks in terms of his reading speed, his familiarity with the materials, and their difficulty. (See Appendix B.) Control of degree of comprehension in reading for a defined purpose was obtained by having the passage read and re-read if necessary to full comprehension under individually timed conditions up to a maximum of five trials.

Results of the Experimental Testing

Basic Data

The number and percent of subjects by trials who achieved criterion reading performance (perfect score on comprehension test) as well as those unsuccessful, for Week 1 and Week 2 according to type of training are shown in Table 2. It should be remembered that the children remained in the same type of group each week so that those in the Test Training group for Week 1 remained in this group the second week and similarly there was no shift of subjects in the Verbal Cues Group from Week 1 to Week 2. It will be noted that approximately 50 percent of the subjects under Test Training conditions were successful in reading to full comprehension within the first two trials both weeks, while subjects in the Verbal Cues group were somewhat less successful. There was thus a somewhat larger proportion of successful performers in trials one and two in the Test Training group than in the Verbal Cues group both weeks. The percentage of

TABLE 2

NUMBER AND PERCENT OF SUBJECTS ACHIEVING FULL COMPREHENSION

Trial	Week One				Week Two			
	Test Training		Verbal Cues		Test Training		Verbal Cues	
	N	Percent	N	Percent	N	Percent	N	Percent
1	26	20.39	23	17.96	26	20.39	27	21.09
2	38	29.68	28	21.87	39	30.46	29	22.65
3	22	17.18	23	17.96	25	19.53	26	20.39
4	21	16.40	25	19.53	17	13.28	14	10.93
5	9	7.03	10	7.81	9	7.03	13	10.15
Unsuccessful on all Trials	12	9.38	19	14.84	12	9.38	19	14.84

children who did not succeed in five trials was also less in the Test Training group both weeks. Therefore, on the basis of the percentages by trials given in Table 2, it would appear that the children given test training (an additional practice test) tended to show better reading performance than those merely receiving verbal cues about the nature of the test.

In order to provide additional information on the reading times of the subjects, the median reading time in seconds for each stanine is given in Table 3. It should be remembered that these values typically constitute the aggregate of more than one reading performance, except in stanine 9 in which most children took only one trial. Essentially there was little difference in reading time

TABLE 3

STANINE MIDSCORE READING TIME IN SECONDS BY WEEK

Stanine	Week One Seconds	Week Two Seconds
9	31	31
8	39	38
7	52	51
6	73	70
5	103	96
4	138	133
3	195	198
2[a]	174	168
1[a]	233	241

[a] Unsuccessful in meeting criterion performance in five trials.

for corresponding stanines from Week 1 to Week 2. While there were some children in stanine 8 who were successful in reading to full comprehension on the first trial, these subjects were greatly in the minority. As would be expected, the subjects in the lower stanines were for the most part children who re-read the materials several times.

The mean stanine values for the seven major conditions are given in Table 4 for Week 1 and Week 2.

It should be noted that all except one of the means in the second week were above 5.000, whereas all but three were below 5.000

TABLE 4

MEAN STANINE VALUES (READING SPEED) FOR THE SEVEN MAIN EFFECTS BY WEEK

Main Conditions	Week One	Week Two
Type of Training		
Test Training	5.078	5.344
Verbal Cues	4.508	5.031
Test Purpose		
Main Idea	4.664	5.148
Sequence	4.922	5.227
Style		
Narrative	4.547	4.672
Expository	5.039	5.703
Paragraph Organization		
Inductive	4.508	5.227
Deductive	5.078	5.148
Complexity		
Simple	4.648	5.297
Complex	4.938	5.078
Training Purpose		
Main Idea	4.711	5.125
Sequence	4.875	5.250
Sex		
Male	4.680	5.141
Female	4.906	5.234

the first week. Furthermore, in all instances the mean stanine score for the corresponding condition was higher in the second week than the first. Although the between-week differences were not great, they suggest that a single exposure to the testing situation resulted in an improvement in test performance the second week; i.e., the children apparently rapidly oriented themselves to the reading tasks and to the testing conditions.

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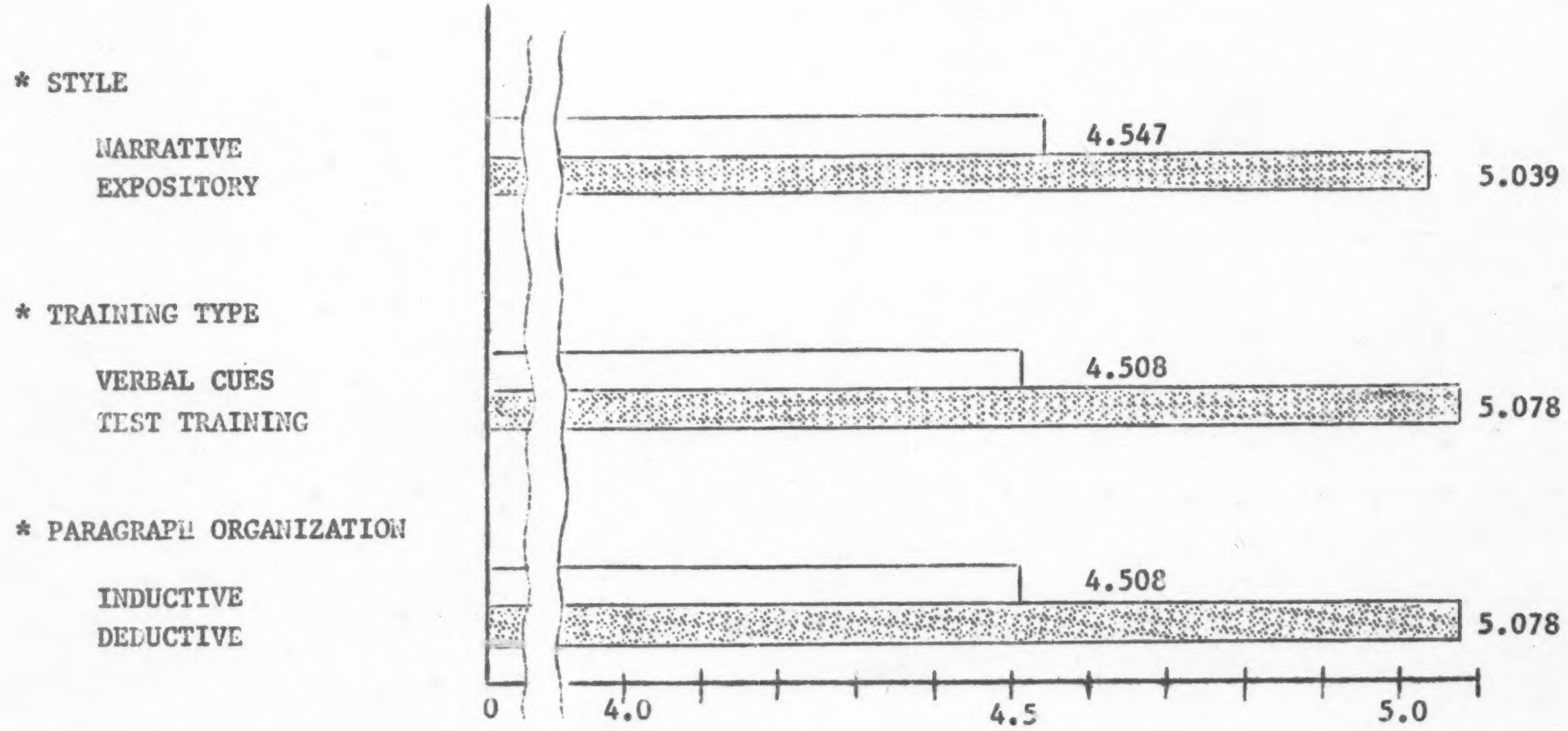
Results of the Analysis of Variance

The more refined statistical treatment of the data by analysis of variance enabled the investigators to determine more precisely the confidence which could be placed in the differential effects of the experimental conditions. Figure 1 shows comparisons of the mean stanine values for only those main effects for which significant differences were found during the first week. It will be noted that type of training was during the first week a factor of some consequence in reading performance. The children receiving test training performed significantly better than those who received verbal instruction only. The nature of the reading material also made a difference, for children performed significantly better on expository than narrative material and significantly better on paragraphs organized deductively than inductively. From the first order interactions given in Figure 1 it is apparent that performance on the narrative and expository materials was differentially influenced by training purpose, and that performance on inductive and deductive paragraph also varied with test purpose. It is also apparent from the two significant second order interactions that reading performance with respect to paragraphs style varied with sentence complexity and type of training and with test purpose and test training. Hence many factors apparently contributed to the difference noted for style. There were no significant overall sex differences in reading performance, nor did sex interact significantly with any of the other factors.

The data for the same major conditions, similarly analyzed and compared for the second week, are shown in figure 2. It will be

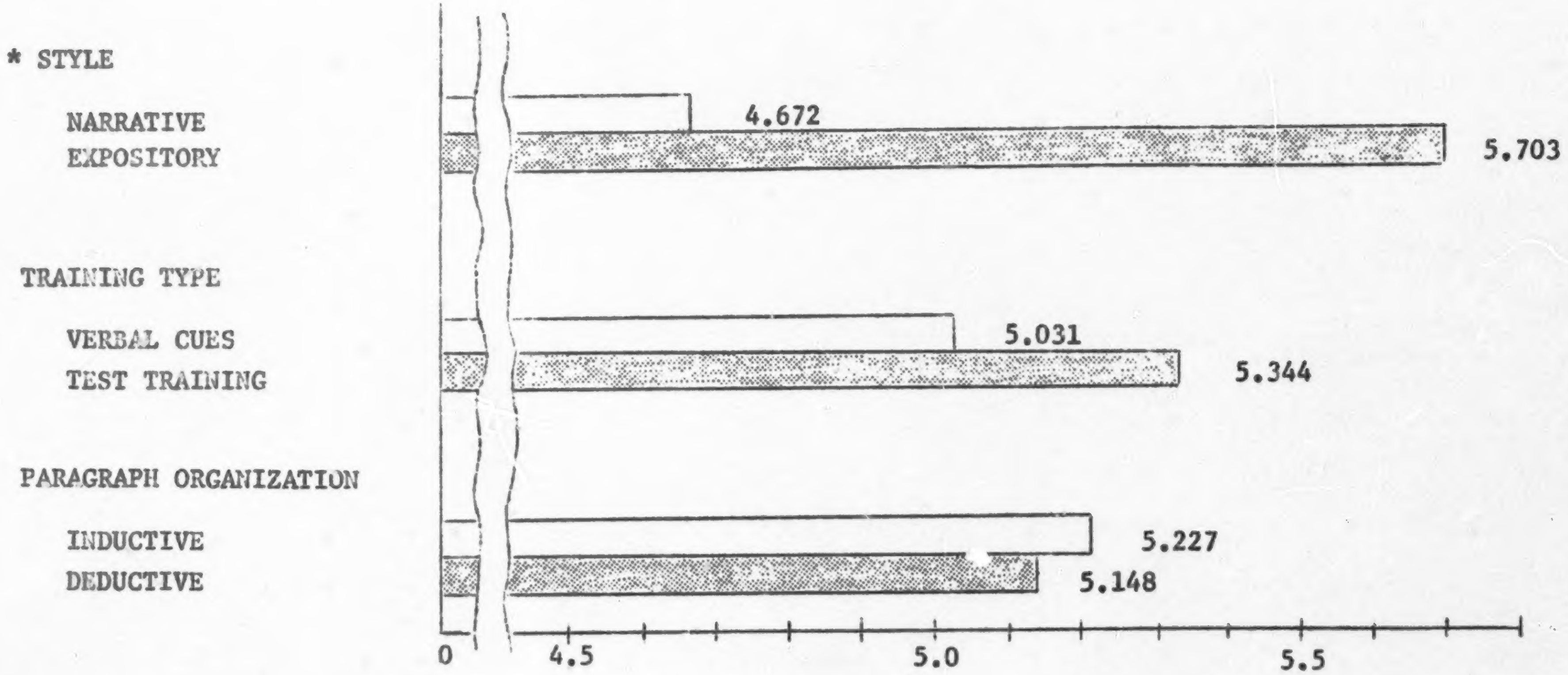


Significant Interactions

** Style X Training Purpose
* Paragraph Organization X Test Purpose
* Style X Complexity X Training Type
** Style X Test Purpose X Training Purpose

* Significant at $p < .05$
** Significant at $p < .01$

Fig. 1.--Mean stanine values of reading speed according to paragraph form and style, first week.



Significant Interactions

* Style X Test Purpose
** Style X Training Purpose
** Test Purpose X Training Purpose
* Style X Paragraph Organization X Training Type
** Style X Test Purpose X Training Purpose
* Paragraph Organization X Training Type X Sex
** Complexity X Test Purpose X Sex

* Significant at $p < .05$
** Significant at $p < .01$

Fig. 2.--Mean stanine values of reading speed according to paragraph form and style, second week.

noted that whereas significant main effects were obtained the first week for type of training, style, and paragraph organization, style was the only factor among these which produced a significant effect the second week. As indicated by two of the three first order interactions, performance on the narrative and expository materials varied with both test purpose and training purpose. The significant second and third order interactions again demonstrated that the observed difference in reading narrative and expository materials was influenced by a combination of many factors. Although this difference appeared to be accentuated the second week, it is not entirely clear why the children scored higher on the expository than on narrative material. Perhaps the differences were a function of greater possible clarity in the organization of expository materials.

It may be observed that the initial practice test given the Test Training group may have contributed to the superior performance of this group during Week 1. However, by Week 2, the later practice effects of taking the tests apparently erased the difference in the performance of the two groups. The results suggest that paragraph style may be an important factor in accounting for differences found in rate of reading as expository materials were read more rapidly than narrative. The effect of style also seemed to be accentuated by practice. Deductive materials were read more rapidly to full comprehension than inductive materials during the first week only. Training purpose and test purpose were of no measurable consequence, nor was paragraph complexity or sex a significant factor. Insofar as conclusions may be drawn from data in which children are randomly assigned to different reading conditions for successive reading tasks it would seem that reading speed did not vary materially in these children as a function of either the purpose or the nature of the reading task.

Effect of Sequence Patterns upon Reading Speed

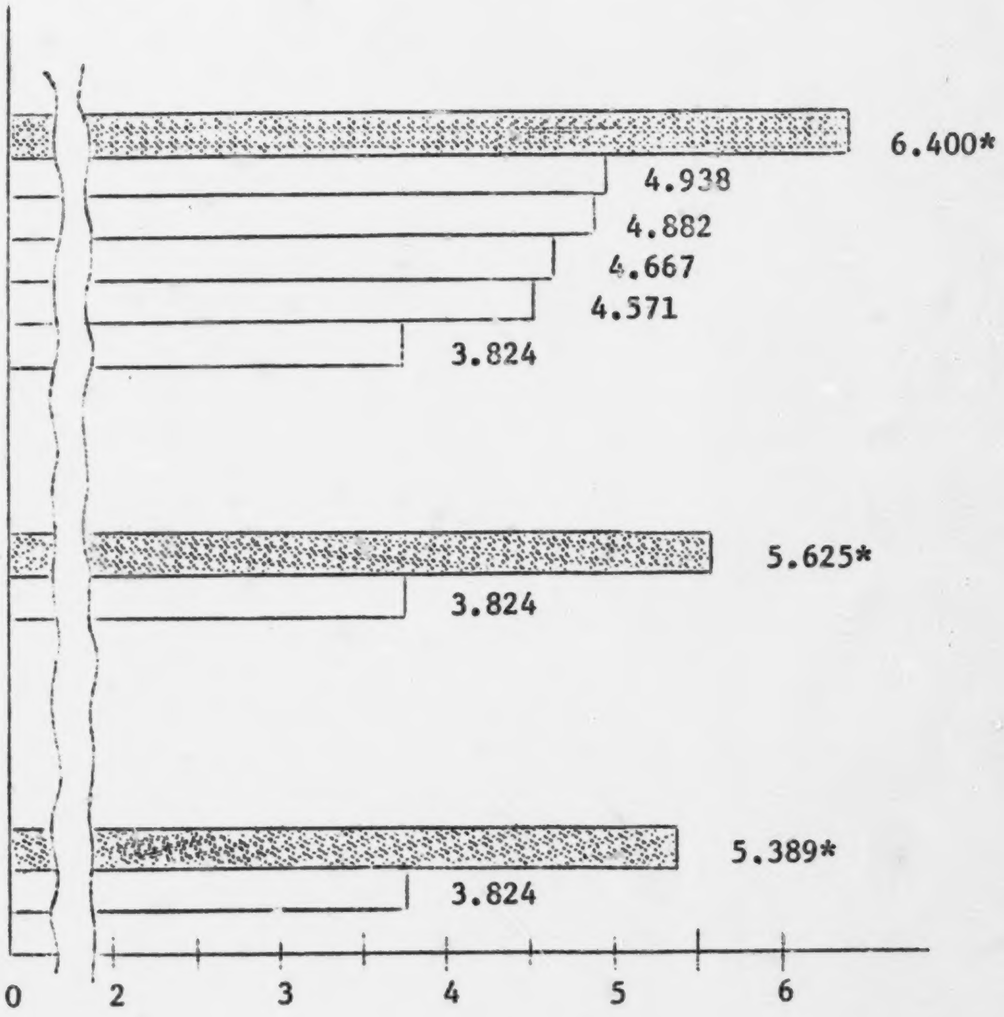
In the analysis of variance, mean stanine speed scores for eight patterns of training-testing sequences across weeks were obtained. The Duncan Multiple Range Test was applied to the final test performance scores to test the significance of the difference in reading speed for these patterns. No significant differences were found for the Test Training groups. The results for the Verbal Cues groups are indicated in Figure 3.

Remembering that the higher the stanine value the faster the speed of comprehension, it will be noted that three training sequences produced stanine values of 5.000 or higher while one sequence produced a stanine value below 4.000:

Group	Week 1		Week 2		$\bar{X}$ Stanine
	Training	Testing	Training	Testing	
I	MI	MI	Seq	MI	6.400
VIII	Seq	Seq	MI	Seq	5.625
II	MI	MI	Seq	Seq	5.389
III	MI	Seq	Seq	MI	3.824

The speed scores for the Group I pattern were significantly higher than all other patterns except for Groups II and VIII, while each of the three higher speed groups, Groups I, II, and VIII, were significantly faster than the slowest group, Group III. Other

Group	Week 1 Training		Week 1 Testing		Week 2 Training		Week 2 Testing
I	MI	→	MI	→	SEQ	→	MI
VI	SEQ	→	MI	→	MI	→	SEQ
VII	SEQ	→	SEQ	→	MI	→	MI
V	SEQ	→	MI	→	MI	→	MI
IV	MI	→	SEQ	→	SEQ	→	SEQ
III	MI	→	SEQ	→	SEQ	→	MI
VIII	SEQ	→	SEQ	→	MI	→	SEQ
III	MI	→	SEQ	→	SEQ	→	MI
II	MI	→	MI	→	SEQ	→	SEQ
III	MI	→	SEQ	→	SEQ	→	MI



*Mean significantly different at .05 level from adjoining means, using Duncan Multiple Range Test.

Fig. 3.--Mean reading speed stanine values on final test performance for eight training-testing patterns, verbal cues training group only.

training-testing patterns yielded speed scores clustering in the upper half of the fourth stanine.

The reasons for these observed differences are not entirely clear for the specific patterns characterizing the three fastest reading groups from other groups are quite varied. One possible factor of significance, however, may be noted. In each of the three groups attaining the highest speed scores, the type of initial training and testing on the first day was consistent, whereas in only one (Group VII) of the remaining five groups which read less rapidly was this the case. It is conceivable that the consistency of the first day training-testing sequence helped crystallize a favorable set that enabled the pupils in Groups I, II and VIII to adjust most efficiently to the reading task. Admittedly, however, this conjecture does not explain why Group VII was not more successful. It would appear, however, that consistency in the testing-training sequence after the first day was less critical than first day consistency, as an examination of the patterns for Groups IV and V suggests insofar as group differences may be attributed to this factor.

Discussion

The results of the testing showed that the task and materials were reasonably realistic for most of the experimental population, but that some simplification of the experimental task might be desirable to produce successful responses in fewer trials. It is noteworthy that most children succeeded in the task even under stringent conditions in which they were trained to read for the one purpose and then tested upon another. The initial test training given some subjects soon lost any special advantage indicating that the tasks could be quickly learned. The results also suggest that groups of 4th grade children randomly assigned to reading tasks on successive weeks do not materially vary their reading rate when reading for the Main Idea or reading for the Sequence of Ideas under the conditions defined in this study.

At the same time, valuable evidence was gained concerning the role of style and the interaction of purpose and paragraph organization with style in differentiating speed of comprehension for further consideration in the subsequent testing and training program. On the other hand, it appeared that sentence complexity within the limits set for this study was hardly a significant variable for continued study. While no evidence of significant sex differences was found, it was decided nevertheless to retain this variable for further study.

During and subsequent to the construction, administration and analysis of the results of the experimental testing, the research group gave further consideration to the specific nature of the training program, to the reading purposes to be included, to the range and type of materials needed, and to the tests needed to appraise its effects. These matters are considered in the following chapter.

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CHAPTER III

CONSTRUCTION AND DESIGN OF THE EXPERIMENTAL TRAINING PROGRAM AND MATERIALS

The experimental training program was designed to achieve two goals, namely: (1) to develop a reading materials program which would produce appropriate variability in speed of comprehension, and (2) to learn which kinds of instructional conditions and procedures had the greatest potential for developing such variability in the classroom.

Two major tasks were involved in the accomplishment of these overall goals. First, training materials had to be prepared. Second, instructional procedures had to be planned and organized into a unified program. Thus both of these tasks required attention to the process of curriculum planning. The four curriculum planning operations of establishing objectives, selecting activities, organizing learning sequences and evlauating learning outcomes were therefore involved in planning the training program.

The process of arriving at final decisions about the general program included the study of the variables which affect learning, a survey of intermediate grade reading materials, and an experimental pilot study. The approach taken by the research staff throughout this process can best be described in terms of a problem-solving sequence. When questions were raised, a careful study was undertaken to define and clarify issues. After extensive discussion and review of various alternatives, tentative proposals were formulated. These proposals were then tested, evaluated and modified. Continuous re-examination and evaluation of issues, proposals and decisions characterized the approach taken by the investigators.

The broad curricular considerations which led to the final preparation of the training materials and procedures will be discussed in the first part of this chapter. The specific decisions for implementing the instructional phases of the study will be presented in the latter portion of the chapter.

Basic Considerations in the Preparation of the Training Materials

Preliminary discussions regarding the nature of training materials raised questions such as:

1. What should be the format of training materials?
2. What content fields should be represented?
3. How should specific selections be organized?
4. Should graphic materials be used?
5. How much should the materials be structured?

A number of basic curricular considerations were examined during the discussion of these and similar questions. Four criteria suggested by Herrick, *et al.*, (14:83-9) for selecting learning experiences provided a convenient framework for reviewing these considerations. The criteria are: objectives, organization, the learner, and resources.

Objectives

In the current study the general aims of the research project served as the source of the objectives for the training program. These objectives were defined in behavioral terms as suggested by Ammons (1), Mager (22), Tyler (31), Goodlad (9), Sand (25) and others. Mager's criteria--1) indicate the terminal behavior, 2) describe the important conditions for this behavior, and 3) specify criteria of acceptable behavior--were especially helpful in this task.

In order to utilize the objectives of the training program as the basis for the selection, organization, and evaluation of the learning activities recommended by Ammons (1), Macdonald (21), Herrick et al. (14) and others, three decisions were made. First, a statement of specific objectives was developed, the final statement of which is shown in Appendix C; second, it was decided that the training materials should represent several subject areas; and third, the decision was made that the training materials should have a logical structure that would afford the learners opportunities to practice the psychological structuring implied by the objectives.

The central objective was reflected in the three purposes that were designated for reading different materials: (1) Reading to Find the Main Idea, (2) Reading to Remember the Sequence of Ideas, and (3) Reading to Find a Specific Fact. The decision to involve several different fields seemed sensible and was buttressed by the findings of Shores' (26) research which indicated that reading speed was affected by different kinds of content. The third decision, to structure the materials in such a way that learners have opportunities to practice the required behavior, follows from suggestions of Tyler (31), Sand (25) and Bloom (3).

Organization

The problem of organizing the training materials involved answering the following three questions in the context of two organizational levels: (1) the relationship of any given learning task to others, and (2) the relationship of elements within a given learning task:

1. What should be the scope of the content throughout the total range of learning tasks and within any given learning task?
2. What should be the sequence involved, both between the tasks and within any given task?
3. How should continuity be provided for at both organizational levels in relation to the learners' psychological structuring and to the logical structure of content?

Scope

Scope was defined as horizontal continuity [see Herrick (13)] in the context of what both Macdonald and Ammons refer to as the bredth of coverage in content. Two decisions about scope were made:

1. The scope of the content of the training materials should be limited to social studies, science, and fiction materials.
2. The scope of individual practice selections should be limited to one central idea.

The decision to limit the scope of the total body of training materials to science, social studies, and fiction was based upon the reasoning that the central concern of the reading research effort should be centered upon common school-related reading tasks. The four most common ideational subject areas in the elementary curriculum are: literature, mathematics, science, and social studies. The content of mathematics would not be appropriate for this specific study because the nature and format of its cultural symbols requires highly specialized reading skills. Literature was limited to the use of fiction because the reading of narrative fiction is of high interest to children and because the inclusion of other literary forms such as poetry did not lend themselves as readily to the nature of the training task. It was felt that science, social studies, and narrative fiction comprised the major portion of the intermediate grade level reading diet.

The decision to restrict the inner scope of individual reading tasks to one central unit or idea was based upon the demands of the research purposes--testing for main ideas, specific facts, and sequence of ideas. Thus, each individual selection contained one central unit of thought explicitly stated in a well defined topic sentence. Further, distractors or irrelevancies were eliminated to produce a clear relationship between the topic sentence and the supporting statements.

Sequence

Sequence was defined as the order of occurrence of the learning tasks as presented to the learner, or the order of the appearance of elements to the learner within a given task. The basic questions asked were:

1. What should be the order of the materials the subjects encountered?
2. How should each learning task be organized in terms of the inner order of statements?

Leonard (20) defines five commonly used types of sequence. They are:

1. Chronological
2. Logical
3. Increasing difficulty
4. Geographical expansions (expanding horizons)
5. Psychological (unfolding of the child)

After a careful appraisal of these five types of sequence, it was apparent that each contained inherent difficulties in terms of the nature of the research task. No chronology could be determined from the nature of the materials. Also, the scope of the materials, spread over these areas, obviated the possibility of a logical sequence. Increasing difficulty was not desirable since a necessary control in the study demanded a common level of difficulty. Geographical expansion was possible as an organizing principle for only a portion of the selections considered and thus was eliminated. It was felt that the psychological unfolding of the child would present proper control of the learning tasks in the context of the study. The question of sequence within any given selection resulted in resolving the problems of style and structure.[1]

Narrative and expository styles were identified. Each represented different kinds of basic sequences within the selection. There was no evidence available to indicate the effect of varying styles on reading speed other than the results of the initial experimental testing in the study in which children performed significantly better on expository materials. It was felt that youngsters ordinarily encounter both styles and thus both should be included in the material.

Bruner (4), Tyler (31) and others have identified two thought structures, inductive and deductive, related to thinking. Since answers to test materials involved thinking, the training materials were organized to fit either an inductive or deductive pattern whereby the topic sentence either came early in the selection or relatively late with deductive structure providing early statement of the main idea and inductive structure leading up to the main idea. Since the only evidence that structure is related to reading speed came from the inschool study in which youngsters did significantly better on deductive material, and since youngsters regularly encounter both kinds of structure, it was decided to include materials with both inductive and deductive sequence structures.

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[1] In a real sense sequence became a part of the research study in relation to its hypotheses. Thus, the five specific training groups described later in this chapter are in fact differentiated in terms of five different sequences or patterns. Each pattern was built within a common agreement to present training materials in a similar order to that in which the test materials appeared. Thus, each subject experienced a sequence which allowed him to practice the behavior upon which the test materials were built. This can be described as a logical sequence built upon the logic of the research study rather than the logic of the subject matter, *per se*.

Evaluation

The following questions concerning evaluation are illustrative of those considered by the research group:

1. How may the evaluative observations be made objective?
2. How may the evaluative observations be made relevant to the training goals and the behaviors which their goals represent?
3. What type of evaluative instruments are appropriate for this training program?
4. How and to what extent should self-evaluation by the learner be planned for and encouraged in the training program?
5. How may comparable evaluations across training groups be made?

Particular concern was felt by the research group that the evaluative procedures used in the training program objectively reflect appropriate behaviors in all training groups, and that each pupil be given ample opportunity to evaluate his own progress.

The Learner

Several considerations pertaining directly to the learner were taken into account during the process of planning the training materials. An examination of the literature revealed a number of individual variables that should be considered. Kingsley

(18;30), for example, suggested the following variables: maturation, age, sex, previous experience, capacity (mental age, intelligence and aptitude), physical handicaps and motivation. Herrick (13), Smith (27), Sand (25), Hilgard (16) and others suggest similar concerns.

From the consideration of these and other writings the following problems were examined in relation to the 4th grade children in the study:

1. Individual capabilities
2. Length of material
3. Difficulty of content
4. Meaningfulness of material
5. Perceptive functions

Individual capabilities were taken into account to the extent that the research subjects were drawn only from children at or above grade level in reading ability.

During preliminary testing it was discovered that 4th grade pupils had considerable difficulty ordering a twelve item sequence in two paragraphs. A much higher level of success occured when six to eitht items, from 66 to 100 words in length, were ordered in a single paragraph. Each exercise in the training and testing material was constructed to meet these conditions.

Difficulty of content is closely related to length of material. Kingsley (18), Krueger (19), and Hildreth (15), for example, emphasize the deleterious effect on learning of material that is too difficult. With these findings in mind, it was decided to attempt to control vocabulary and level of abstraction by using intermediate grade level materials as a guide for the construction of the training test materials. Several judges experienced at the intermediate grade level were utilized to evaluate the difficulty of materials, and a final precaution was taken by allowing experimenters to define any terms the subjects felt were difficult.

The importance of meaningfulness of the material is highlighted by studies such as those by Kingsley (18), Guilford (10) and Swenson (29). These studies clearly indicate the practical importance of meaningful contexts for learning. In this connection, a survey of curriculum guides and childrens' literature at the intermediate grade level was made. The materials selected were limited to those which would fall within the broad experiences that youngsters would ordinarily encounter. Furthermore meaningful organization within selections was facilitated by using cause and effect relationships, similarities and differences, and otherwise relating one sequence to another.

The general nature of perceptive functions of the learner was also considered. Studies by Proshansky and Murphy (23), Hamilton (11), Bruner and Goodman (5), Carter and Schooler (6) and others emphasize how individual perceptors are influenced by needs, evaluation, values, social conditions, and reinforcements.

Since it was not feasible to assess the states of the above variables on the perceptive functions of the subjects, it was decided to attempt to sharpen common perceptions of task and materials by providing a training period. It was hoped that this training period would provide a basis for developing necessary common perceptions and perceptual sets for the research task.

Resources

All of these considerations of objectives, organization of activities and materials, learners, and resultant decisions focussed attention upon the availability of resources. The major concern was whether practice materials having the characteristics specified by these decisions could be selected from existing materials. The advantages of selecting practice materials from existing resources were twofold. First, existing materials represented the kinds of subject-matter, the stylistic forms, the patterns of structure and the content being used in the schools. Second, it would be much more expedient to draw from existing reading materials and lessen the danger of creating highly artificial material.

With these considerations in mind, the investigators reviewed their survey of intermediate level reading materials and also scanned a wide variety of reading materials in textbooks, tradebooks, and trade-texts. Examples of the kinds of materials which were explored are:

1. The Dolch Series--supplementary readers with highly controlled vocabulary designed for easy decoding.
2. Amos Fortune--a tradebook.
3. The Landmark Series--a trade-text organized around children's interests e.g., horses, pets, guns, etc.
4. Various reading social studies and science textbook series.

Marked differences were found in paragraph length, style and structure. There were also vast differences in the scope, sequences employed, levels of abstraction, and vocabulary used in materials earmarked for the same grade level or the same general subject area. Categorizing materials according to content and style proved to be extremely difficult. Expository and narrative styles were found in all types of fiction, science and social studies materials. Topics did not always differentiate fiction, social studies and science content. Science-fiction, historical-fiction, legend, myths, etc., appeared in all fields. Inductive-deductive style and a wide variety of plot structure appeared in all forms of intermediate reading matter. Frequently, authors switched from inductive to a deductive structure and back again within the space of a few paragraphs.

The large quantity of unstructured, poorly organized and grammatically incorrect passages observed was discouraging. Frequently, the researchers discovered the only criterion of a paragraph met by some group of sentences was that they were indented. Many so-called paragraphs did not seem to have either an explicit or implied main idea. Many of these paragraph-like units covered several unrelated topics.

On the basis of these findings it was concluded that existing resources were not adequate in their present form for the purposes of the training program. Therefore, it was decided that practice materials would have to be constructed. The specifications for the testing materials described in Chapter II were used with some modifications as guidelines for constructing the practice selections. Briefly the scope of content, the narrative and expository style, the deductive and inductive structure, the level of abstraction, the patterns of sequences, the vocabulary level and the use of explicitly stated topic sentences which were followed in the test selections were also incorporated into the practice materials. It was decided, however, to disregard rigid limits of sentence complexity and to permit wider latitude in length of sentences and paragraphs. It was also agreed that wherever possible the content of existing resources would be rewritten. Samples of the practice selections and a list of the topics covered exclusive of the test materials, may be seen in Appendices D and E respectively.

Planning Instructional Procedures and
Organizing the Training Program

Establishing Objectives

In retrospect it appears that Ammons' (1) six steps for developing objectives provide an overview of the procedures followed. Briefly outlined, these steps are:

1. Clarification of the general aims of the research project and the translation of those aims into educational objectives.
2. Selection of relevant data sources e.g., research findings, experts, books to determine whether the objectives were appropriate for the children.
3. Consideration of the operational situation to determine whether the intended objectives were feasible.
4. Analysis of the statements of objectives to determine their clarity and usability for selecting, organizing and evaluating learning experiences.
5. Study and disucssion of the objectives for the purpose of judging their internal consistency so that any inconsistent

objectives could be eliminated.

6. Evaluation of the reformulated objectives to determine their comprehensiveness.

Following these steps, several members of the research staff formulated tentative statements of objectives for the training program. These were then critiqued by the entire staff. A number of modifications were suggested and several subsequent drafts were written before two final statements were accepted. It was recognized that these statements were not absolute or final; rather, they were considered working guides.

Selecting Learning Activities and Instructional Procedures

This operation is acknowledged by most curriculum specialists to be a process of formulating value judgments. The process used by this research staff corresponded closely to the following sequence described by Tyler (31:53):

1. Formulate possible activities
2. Outline in detail what to include
3. Check against objectives
4. Check against the criterion of effect
5. Check against pupil readiness
6. Check for economy of operation
7. Check against generalizations about the characteristics of good learning experiences.

During this process of selecting instructional procedures considerable attention was paid to selecting an appropriate method of teaching. Two approaches were reviewed: prescriptive teaching and the discovery method. A review of the literature reveals markedly different views on the merits and disadvantages of these two approaches. Wertheimer (32), for example, suggests that prescriptive teaching produces nonadaptive learning because the judgment of the learner is omitted and the rationale of understanding is suppressed. Hendrix (12), on the other hand, seems to insist that nothing of significance can be learned except through self-discovery. Ausubel (2) contends that these unreal dichotomies are based on misunderstandings about the kinds of cognitive learning that are possible.

Evaluating this controversy led the research staff to conclude that these positions seemed to create an unnecessary dichotomy between expository teaching and training in skills of productive thinking. It was therefore decided that information would be given to pupils in such form as to encourage their discovery of the skills, concepts and attitudes necessary for flexible reading. Thus while it was recognized that some prescriptive or directed presentation would be necessary in order to exercise sufficient experimental control, the importance of engaging the pupils in a process of discovering how to develop variability in reading speed was also acknowledged.

Perhaps one of the most crucial questions relative to selection in a general sense was: What role should the pupils play in the selection process? Tyler (31), Herrick, et al. (14) and others emphasize the importance of having the learners participate in the selection process.

Who should select the purposes for reading? This question was studied over an extended period of time. The possibility of allowing the pupils to select any one of the three designated purposes and concentrate on reading several selections for that purpose was explored at some length. The effects which self-selection could have on variability in reading speed was seen as a significant area for investigation. Consequently, one of the research assistants undertook this problem as a separate but related study. Certain aspects of self-selection, however, are reported in suceeding chapters.

The two purposes for reading specified for the experimental testing were retained plus a third purpose of Reading to Find a Specific Fact, as testing and training variables in the experimental training program. The decision was made to specify purposes for all reading tasks and test only for the comprehension of the indicated purpose. Pupil formulation of purposes was seen as a separate study and as a possible extension of the present one.

Closely related to the consideration of the role of pupils in the process of selection of purpose was the question of selecting procedures that would enhance the learner's motivation. It was realized that teachers cannot externally motivate learners. Motivation must be intrinsic. The teacher can employ procedures designed to stimulate interest and activate the pupil, but he cannot force the learner to be motivated. It was also recognized that the "Hawthorne Effect" would probably induce some motivation in the experimental subjects. Considering the importance of additional motivation, it was decided to encourage active pupil interest in the tasks to be performed by selecting procedures that would:

1. Demonstrate to the pupils that they could develop variable reading speeds for different purposes.
2. Emphasize the practical values of such an adaptation.
3. Minimize the group competitive aspects of learning the

necessary skills.

4. Provide adequate preparation for the learners so they could acquire these skills readily.
5. Provide continuous positive reinforcement.
6. Provide the learners with complete information about objectives, tasks to be performed, methods being used, and individual progress.

These criteria had numberous implications for the organization of the training program as well as for the selection of evaluative techniques.

Organizing the Instructional Training Program

Consideration of the aforementioned criteria contributed to the decision that the training program should be essentially a self-instructional task. For reasons of experimental control it was felt that the influence of the instructor should be minimal. The practical advantages of self-instructional materials for classroom use were noted.

Organizing such a self-instructional program involved two levels of planning: organizing the overall program and organizing the daily lessons. After a lengthy discussion of the overall structure of the training program, consensus was reached on the following points:

1. The program should be organized to provide continuity. Every learning experience should have some antecedent **and some** consequence.
2. The sequence of the learning experiences should be organized so as to maximize the cumulative effects of preceding learnings.
3. The structure of the program should provide unity and coherency between internal aspects of an experience and also between experiences.

Organizing the overall structure of the training program involved consideration of scope and sequence. Originally the scope of the overall program was considered in terms of a 4 to 6 week training period, with program sequence being thought of as divided into three phases. The first phase, approximately 1 week in length was to be used as an orientation and introduction. During this phase the following tasks would be accomplished:

1. A base rate of reading speed would be established for each child.
2. The concept of reading rate variability would be introduced.
3. Pupils would be given an opportunity to practice reading for three different purposes.
4. The pupils would learn the skills necessary to work independently during the second phase of the program e.g., timing their own reading rate, recording their reading speed, making adjustments in speed for different purposes, etc.

During the second phase of the program the pupils would practice adjusting their reading speed for three different purposes. This phase of the program would be approximately 4 weeks in duration. The final phase of training, approximately 1 week in length, would focus on culminating activities and evaluating progress.

Several factors forced a revision of this conceptualization of the scope and sequence of the training program. Available school time was an important consideration. It was felt that if the training was to be effective it should be conducted on a daily basis and would require at least a 30-minute block of time. It was also felt the same block of time should be utilized every day. Since the training was to be conducted in the children's own schools, adequate space was also required. The combination of these time and space requirements and the diversity of school activities and schedules made is almost impossible to organize a program ranging from 4 to 6 weeks in scope.

Perhaps the most important delimiting factor was that of material. Projecting the number of training selections that would be required for such an extensive program led the staff to conclude it simply was not feasible to prepare all the needed materials.

Taking these practical considerations into account the scope of the training period was reduced to a ten day program. After considerable discussion it was decided to modify the program sequence and utilize the first 3 days as an orientation period. This critical period was seen as a time for preparing the pupils to read for three different purposes. The remaining 7 days would be used for concentrated practice. Further considerations pertaining to the testing materials and evaluation aspects of the whole program introduced still more modifications in scope and sequence. Although the ten day program was retained, some of the time originally set aside for practice was redesignated for testing and evaluative purposes.

Determining the exact sequence for practice proved to be a difficult task. Since the pupils would be asked to read for three different purposes, a variety of sequences could be employed. Some of the alternatives considered were:

1. Reading for only one purpose each day.
2. Reading for all three purposes every day.
3. Reading first to recall a sequence of events and then reading

to find one specific fact. It was felt this approach would maximize the differences in the reading speeds required for these two tasks.

4. Read for one purpose for several days, then, using an additive approach, read for two purposes for several more days and finally read for all three purposes for the remaining time.

Several other possibilities were also considered. After an extended period of discussion, it was decided to organize several tracks within the training program. Each track would place an emphasis on practice reading for one particular purpose. This decision resulted in part because the staff was unable to achieve any consensus about which single sequence appeared to be the best.

The final training program formulation called for differential training emphases in each of five training groups such that the amount of practice upon a given purpose for reading was systematically varied in four of the groups but was determined by pupil self-selection in the fifth group. Total amount of practice and/or testing, however, was held constant across training groups, to the reading of six selections per day.

The nature of daily program emphasis of each of the five training groups may be summarized thus:

Group Training Emphasis	Selections Read Per Purpose		
	Main Idea	Sequence	Specific Fact
1. Balanced	2	2	2
2. Main Idea	4	1	1
3. Sequence	1	4	1
4. Specific Fact	1	1	4
5. Self-selection	varied	varied	varied

A decision as to the precise combination of relative emphasis upon specific reading purposes was perhaps the most difficult training decision faced by the investigators. The early disposition of the research group was to plan and test one or more presumably "optimal" sequences for introducing successive reading purposes. The final decision to control amount of reading practice but vary the degree of practice upon reading for particular purposes appeared the more promising approach to understanding the practice effects of specified conditions. It may be noted, parenthetically, that considerable diversity of opinion existed among the research staff at the beginning of the training program as to which of the training conditions would produce the most flexible readers.

Within this general framework it was also necessary to organize the daily lessons. At this level of organization two types of considerations were taken into account. The first had to do with organizing the learning task. The second was concerned with administrative details.

Several considerations were reviewed before any decisions were formulated regarding the learning task. The major considerations were: the length of the practice period, the degree of learning, the role of set in learning, pupil attention and incentives.

Experimental findings regarding the length of the practice period consistently show that the shorter the practice periods, the greater the learning that occurs, provided the time is not too short. If the work time is too brief, the learner is not likely to become properly oriented to the task. Studies by Starch (28:168-9), Pyle

(24:44-5), Hovland (17), Travis (30) and Duncan (7) support this general conclusion. The question: What is the optimal length of practice periods? is answered by another group of researchers. Eaton (8), for example, states that the ideal length of the practice period depends upon the task and the age of the learners. Taking into consideration the experimental task as well as the aforementioned findings, it was decided that the daily practice periods should be approximately 30 to 45 minutes in length for this age group.

A general discussion of the degree of learning resulted in several conclusions. It was agreed that overlearning tends to reduce forgetting and is undoubtedly responsible for much of the retention of skills after long periods of disuse. It should be noted that the investigators were not only interested in demonstrating that variability in reading speed could be acquired but they also hoped that this skill would be retained over a period of time. Conversely, it was also concluded that superficial learning tended to result in rapid loss of skill over time. On the basis of these conclusions it was decided that daily lessons should be well organized to induce maximum learning. This seemed to suggest highly structured lessons in which the exact sequence of tasks to be performed was carefully controlled. It was generally agreed that pupils should read at least one selection for each purpose each day.

As noted earlier, the role of set was seen as a major consideration. It was felt that most readers with inflexible reading speeds were probably slow readers who read for detailed recall. This was assumed to be true because it appears that in most classroom reading situations pupils are asked to read to remember everything--the main idea, specific facts and the sequence of events. Faced with this task many pupils develop a slow, methodical reading speed. This soon becomes an inflexible set for all reading tasks. Breaking down this set and training pupils to vary their reading speed seemed to call for lessons so organized that each pupil would have numerous opportunities to read at different speeds. It was also considered essential that the pupils learn at the very beginning of the training that they could vary their reading speed.

Pupil attention was another factor which seemed to have direct implications for the organization of the daily lessons. The investigators agreed that attention was an indispensable condition for successful learning. It was also pointed out that a pupil does not remember things to which he fails to give attention. Poor teaching conditions, lack of space, improper lighting, etc., as well as uninteresting material, groups that are too large, the failure of the teacher to provide individual help and numerous other distractors were seen as obstacles to pupil attention. Consequently, a number of decisions about administrative details were formulated. Briefly reviewed these decisions were:

1. Training groups should be small, i.e. less than 20 pupils.
2. A large, well-ventilated, well-lighted, quiet room was essential.
3. Each pupil would need individual work space.
4. All supplies needed by the pupils should be furnished by the researchers.
5. One adult should be assigned to work with every two children.
6. There should be one instructor per group in addition to the

adult assistants.

7. Instructors and assistants should be carefully trained to perform their duties and handle unexpected contingencies.
8. Printed instructions should be prepared for instructors, assistants and pupils.

Finally it was considered important to organize each lesson so that learning tasks would be clearly defined, pupils would be actively engaged in constructive activities and the whole lesson would be conducted in such a manner as to accentuate the positive aspects of the learning task.

This latter point directed attention to the matter of incentives. The instructor was seen as a key figure in the learning situation because of his power to manipulate various incentives. The advantages and disadvantages of using positive and negative reinforcements, praise, blame, reward, punishment, sarcasm, and ridicule were thoroughly discussed. As a result it was decided that formal lesson plans would be organized and the precise dialogue to be used by the instructors would be explicitly stated and followed. Besides insuring a positive approach, it was recognized that this discussion would result in standardized lessons. For experimental control purposes this was seen as a distinct advantage.

Spelling out the exact wording for each lesson called for organizing a precise sequence of events. After considerable discussion, several preliminary proposals and a review of the steps involved in reading for three purposes, a tentative sequence was organized. Since the first 3 days of the training program were seen as an orientation period to subsequent practice periods, the sequence of events for each of these 3 days was therefore unique. The sequence of daily events for the last 7 days of the training period were identical from day to day within each of the different tracks of the program. Pupils were asked to assume a primary responsibility for such tasks as timing their reading by using stop watches, using tables to convert time scores to rate of reading scores, and graphing their daily progress by type of purpose.

In addition pupils made daily evaluations of their general satisfaction with their tasks, of the extent to which they thought they were successful in varying their reading speed, and the accuracy with which they felt they predicted their speed of reading for each purpose. The latter activity, prediction of reading speed, was asked of each pupil for each selection from the third day of training on in order to gather additional specific evidence of his perception of the task and his level of aspiration. The initially planned sequence of events for each succeeding day may be outlined as follows:

1. The pupils were to receive a complete set of self-instructional materials.
2. The pupils were to operate their own stop watches to time their own reading speed.
3. The pupils were to read the directions and the first practice selection.
4. After completing the first reading of the first selection and recording their reading time on a time record sheet, the pupils were to complete an answer sheet relative to the story just read.
5. Five re-readings were to be permitted in order to give the

learner opportunity to achieve 100 percent comprehension.

6. Answer sheets were to be corrected by adult assistants and shown to the pupils after each trial.
7. Raw time scores were then to be translated into words per-minute scores by the pupils. A conversion table was supplied for this purpose.
8. The pupils then were to graph their reading speed on a large chart. This chart would enable them to visualize the differences in their reading rates for different purposes and also watch their progress in skill improvement.

It must be recognized this sequence was modified several times before the final training program was developed. Of major significance was the introduction of several steps related to pupil prediction of reading rate. The rationale behind this procedure is explained in Chapter V.

Evaluating the Learning Activities

Many of the steps in the aforementioned sequence were directly related to the previous consideration of evaluative techniques.

Three major decisions emerged from the examination of these basic considerations. First, it was decided that subjective evaluation by the instructors would be minimized if not completely eliminated from the daily lessons. Second, pupils would be given daily opportunities to objectively evaluate their own progress. Hence, the use of the conversion table, the time record sheet, the individual pupil graph and the procedure of showing pupils their corrected answer sheets were initiated. Finally, it was decided that a pilot study would be organized for the purpose of evaluating the training materials, instructional procedures and the program structure.

This pilot study was conducted in a parochial school in Madison, Wisconsin. Six 4th grade pupils participated in a 2 week training program. Three instructors were used during this time. The observations and analysis of the results of this pilot study proved invaluable aids to the research staff. As a result of this study several modifications in training materials, instructional procedures and program structure were introduced.

Pre- and post-test materials were used before and after the training program. In addition, daily "practice" tests were constructed to measure speed of comprehension for each of the training purposes. Each of the five experimental groups followed a different pattern of emphasis upon three specified purposes for reading with common daily "practice" tests administered to all but the self-selection group. A common pre-test, post-test, and retention test was also given all groups, as was a common preliminary training program, according to the following schedule:

1. Pre-testing of subjects 1 week prior to the training program.
2. Two-week training program for subjects in five different training groups.
3. Post-testing subjects 1 week after the training program
4. Retention testing of subjects 3 weeks after the termination of the training program.

Summary

The process of arriving at a final training program formulation may perhaps be best described as a series of progressive approximations to the goal of this phase of the study. This goal was defining a set of experimental training conditions that would on the one hand be feasible to carry out in schools, and on the other hand, would yield an optimal amount of information about training materials and conditions which would produce efficient speed of comprehension for each of three designated reading purposes: Reading for the Main Idea, Reading for the Sequence of Ideas, and Reading to Find a Specific Fact. In other words, the goal of the training program was not only to determine if children in the 4th grade could be taught to vary their reading speeds for different specified purposes (the general training hypothesis), but also to learn more about the practice conditions under which this might be accomplished.

The successive cycles of examination of issues, tentative program formulations, evaluation of these formulations and issues, and their re-formulation gradually led to a number of decisions which were reflected in the final resolution of the experimental training program and the specific hypotheses it was designed to test.

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CHAPTER IV

METHODOLOGY, DESIGN AND RESULTS OF THE EXPERIMENTAL TRAINING PROGRAM

The purpose of this chapter is to describe the nature and results of the experimental program designed to test the second major hypothesis of the study--that 4th grade children may be taught to significantly vary their reading speeds for different specified purposes.

General Characteristics of the Training and Testing Program

Overview

Table 5 shows the pattern of testing and training followed in the study. Subjects were randomly assigned to each of the five experimental training groups identified in column 1. In addition, control group 1 was field-tested upon the same test materials as the experimental group. The same test materials were likewise administered to control group 2 but under laboratory-testing conditions.

As shown in column 2, each of the seven groups thus formed was composed of 12 subjects, six boys and six girls, for a total population of 84 pupils. Twenty subjects, ten boys and ten girls selected randomly from the experimental population, were tested individually under laboratory conditions in addition to those subjects in control group 2. Thus 32 subjects were laboratory-tested and 52 subjects field-tested. In the laboratory testing, measurements of the galvanic skin

TABLE 5

OVERVIEW OF THE EXPERIMENTAL TESTING-TRAINING SEQUENCE

1	2			3	4					5	6	7
Training Groups	N[a]			Pre-Test	No. of Daily Selections Read by Purpose					Total Selections Read Days 1-10	Post-Test	Retention Test
	Class	Lab	Total		Days 1-3	Days 4-10						
						MI	Seq	SF	Total			
Experimental					All Subjects read three selections daily, one for each purpose.							
Main Idea	40	20[b]	12	0		4	1	1	6	51	0	0
Sequence			12	0		1	4	1	6	51	0	0
Specific Fact			12	0		1	1	4	6	51	0	0
Balanced			12	0		2	2	2	6	51	0	0
Self-Selection			12	0		Varied			6	51[c]	0	0
Control												
Control 1	12	--	12	0		-	-	-	-	--	0	0
Control 2	--	12	12	0		-	-	-	-	--	0	0
TOTAL	52	32	84									

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[a] All groups contain an equal number of boys and girls.

[b] Randomly selected from training group N.

[c] Additional selections were prepared for the use of this group since they could select the purpose for reading.

response and selected muscle action potentials were secured as evidence of the general state of tension while taking the pre-, post- and retention tests.

Columns 3, 6 and 7 indicate the observations made at 2-week intervals to measure test performance in reading. Column 4 indicates the common nature of the first 3 days of the training program and the subsequent different daily training emphases followed by each experimental group. It will be noted that while group training patterns varied after the first 3 days, the total number of selections read per group per day was the same at all times. The grand total of 51 selections read by each of the experimental groups is the sum of the nine selections (three per day) read during the first 3 days of common training, plus the 42 selections (six per day) read during the 7 days of differential group training.

Composition of the Sample

Four schools in the western section of Madison were selected from the 13 schools which volunteered to participate in the 4th grade experimental training program in the spring of 1964. The schools chosen displayed these characteristics: (1) each had a sufficiently large 4th grade population reading at or above the 4th grade level[1] to satisfy the numbers needed for at least one of the five experimental and two control groups; (2) each had satisfactory space for housing the training groups during the school day; (3) each represented a relatively homogeneous upper and middle class in socio-economic as well as general pupil scholastic ability level;[1] and (4) the schools as a group were sufficiently close together to make the conduct of five simultaneous training programs logistically feasible. Two training groups were assigned to one school and one each to the other three schools. It should likewise be noted, however, that all control subjects were taken from one school in the same geographical sector, but which otherwise met the same general criteria for selection as did the experimental schools.

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[1] Subjects selected had attained scores on the reading comprehension portion of the STEP at the 50th percentile or better during the school testing program in the fall of the preceding year. Grade level reading performances of all subjects at or near this point was confirmed by teacher judgment prior to selection for training.

Subjects were assigned randomly to each of the experimental training groups across schools. One effect of this procedure was to have each of the training groups in a school represent each of the five conditions of training.[2] This was feasible because of the common group procedure followed in the first 3 days and the self-instructional nature of the tasks during the balance of the training period. A second result of this mode of assignment was to minimize possible experimenter bias effects in a given school group since each group was composed of some subjects in each of the five training conditions. In actual practice, 14 randomly selected subjects received training in each of the experimental groups.

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[1] Reported IQ's for the total population of the study on the California Test of Mental Maturity administered in grade 3 were: boys 126; girls 120; combined 123.

[2] Subsequent reassignment of subjects in training groups across schools changed the actual numbers of subjects identified for laboratory testing per training group. The number of laboratory subjects per training group was as follows:

Group	Males	Females
Balanced	1	3
Main Idea	2	2
Sequence	2	0
Specific Fact	3	3
Self-selection	2	2
Totals	10	10

This step was taken to insure complete records upon 12 subjects in each training group in the event that one or two of the subjects originally chosen failed the pre-test, became sick, or otherwise could not complete the training program. Fortunately, very few substitutions in the original training population were necessary.

Administration of the Training Program

The training program in the schools was conducted by four research assistants. Each of the research assistants was an experienced teacher. Furthermore, since all had worked together for a year as part of the research team, had participated in planning the training procedures in detail, and had assumed major responsibility for preparing the training materials, there was good assurance that a high degree of consistency would be maintained across groups in the presentation and supervision of the training programs. One research assistant (male) conducted two of the training groups; the remaining three (female), one each. The training programs were conducted according to the following schedule:

Time	School	Research Assistant
8:15-8:55 A.M.	A	R. B.
9:15-9:55 A.M.	B	E. G.
1:00-1:40 P.M.	C	R. B.
1:45-2:25 P.M.	B	L. S.
2:45-3:25 P.M.	D	A. L.

In order to provide additional help, particularly in scoring each trial on a selection and in supplying new answer sheets as needed, a corps of 17 student assistants was trained and assigned to one or more of the training groups in each school so that one adult was available for the supervision of every two pupils. The student assistants also participated in the initial training of subjects to use stopwatches for timing reading speed to convert scores to rate of reading scores and to graph progress. The same student assistants worked in the same training group or groups from day to day to preserve the continuity of personal contact with the pupils.

Detailed directions which were prepared for the training program are shown in Appendix F. The feasibility of the training procedures was verified by a 2-week pilot project with a small group of subjects in a cooperating parochial school. Methods of procedure were thus practiced by the research assistants who in turn rehearsed the student assistants in their roles and duties. As a result, the investigators concluded that considerable confidence could be placed in the essential comparability of the conditions of training in the several school groups.

Sequence of "Practice" and "Test" Exercises in the Training Program

The following additional characteristics should be noted concerning the sequence of the 51 selections in the training program:

1. An approximately equal balance between narrative and expository materials was sought. (The balance was prescribed for all but the self-selection group which through choice of titles might alter such a balance.)

2. A common sequence of reading purposes in reading successive selections was maintained for each of the first 3 days of the training program. This sequence was: Reading for the Main Idea, Reading for the Sequence of Ideas, and Reading to Find a Specific Fact.

3. The specific sequence of "practice" materials (of varying length) and of "test" materials (of uniform length of 66 words) according to purpose for reading the 42 selections during days 4-10 was as follows:

Type of Training Emphasis	Daily Ordering of Six Selections According to Purpose					
	Practice			Test		
	1	2	3	4	5	6
Main Idea	MI	MI	MI	Randomized Daily		
Sequence	Seq	Seq	Seq	Randomized Daily		
Specific Fact	SF	SF	SF	Randomized Daily		
Balanced	Randomized Daily			Randomized Daily		
Self-Selection	Pupil Choice			Pupil Choice[a]		

[a] Except for days 4 and 10 when the same randomized ordering of selections used in other groups was employed to supply common test data.

Randomized daily ordering of the three purposes for reading the daily test materials was done to avoid a selective speed bias which might result from a fixed ordering of these purposes.

In the case of the self-selection group, each of three boxes of materials held the selections to be read for a given purpose. A complete list of titles arranged by purpose and referred to earlier in Appendix E was also prepared. After a subject consulted his daily chart and chose which purpose he wished to work on, he could then choose a title from the appropriate list and take the selection from the box for reading.

Test Data Available for Analysis

The reading performance testing program yielded two sets of data for analysis. One set of data included evidence of reading performance gathered on the 84 experimental and control subjects during the week before training (pre-test), the week after training (post-test) and three weeks after training (retention test). These tests yielded six speed of reading scores to full comprehension per testing period, according to the following pattern of purposes and styles:

Main Idea - narrative

Main Idea - expository

Sequence - narrative

Sequence - expository

Specific Fact - narrative

Specific Fact - expository

An example of one of the tests is shown in Appendix G. It should be noted that the test selections were randomly ordered for each administration to each subject.

A second set of data available for analysis included that from the pre-test and from selected materials in the testing portion of the daily training program. Useful comparable data, however, could be obtained for only four of the experimental training groups representing 48 subjects to study differences between training groups within certain periods of time, the self-selection group being excluded from this set of comparisons.

The design and results of the second set of data will be presented first to clarify the specific effects of training upon speed of full comprehension for four training groups within the 2-week training period.

Analysis of Within-Period Training Differences

Hypotheses to be Tested

The five specific hypotheses tested in this portion of the analysis were:

1. There will be a significant improvement in average reading speed for all training groups.
2. Improvement in average reading speed will be greatest for the

training group with emphasis upon Reading to Find a Specific Fact and least for the training group with emphasis upon Reading for the Sequence of Ideas.

3. Improvement in average reading speed will be in a predictable direction according to reading purpose, being greatest in Reading to Find a Specific Fact and least in Reading for the Sequence of Ideas.
4. There will be no significant sex differences in improvement of average reading speed.
5. There will be no significant differences in improvement in average reading speed during the early, middle and later portions of the training period among training groups, reading purposes or sex.

Design

In order to study the specific effects of training, test data for four groups (Main Idea, Sequence, Specific Fact, and Balanced emphases) were gathered at four points in the training period--pre-test, day 4, day 7 and day 10--for analysis. These four successive observations yielded three gain scores for each subject, namely the difference in reading time between pre-test and day 4, between days 4 and 7, and between days 7 and 10. The individual gain scores were categorized according to the four training groups, the three reading purposes, and two sexes for purposes of analysis. Passage style was not used in this analysis since with the exception of the pre-test only one common test score on either narrative or expository materials was available for each of the three reading purposes on days

4, 7 and 10. The two pre-test reading time scores per purpose for narrative and expository selections were therefore averaged in this analysis.

The analysis of variance model proposed by Box (1) for the study of average differences across and within periods of time was employed to study the main effects and interactions of the major variables upon reading time. Since the reading time scores in this study represented repeated measures upon the same individuals, the use of average reading time differences per period was considered more appropriate than the use of raw score differences in the analysis.[1]

Results

A summary of the analysis of variance of the main effects and interactions of types of training, reading purpose and sex upon reading time is shown in Table 6. In interpreting these and other data in the across-period analyses, it should be remembered that the scores represent differences in reading time, or gain scores, across three training periods. Thus if a difference is significant and positive, it represents a substantial reduction in reading time necessary to complete the task of reading to full comprehension and indicates greater efficiency in the reading task.

The results indicate that two main effects were significant at the .05 level, type of training and reading purpose. Thus, type of

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[1] See Box (1) for detailed discussion and empirical demonstration of the logic of this distinction. The investigators are indebted to Professor Leslie McLean, now of Columbia University, for suggesting this statistical model.

TABLE 6

EFFECTS OF TYPES OF TRAINING, READING PURPOSE AND SEX ON READING TIME, BASED UPON AVERAGE DIFFERENCES IN READING TIME (IN SECONDS) ACROSS THREE TRAINING PERIODS FOR 48 FOURTH GRADE SUBJECTS

Source	Sum of Squares	df	Mean Square	F
Main Effects				
Training (T)	4572.99	3	1524.33	3.14*
Purpose (P)	3998.43	2	1999.21	4.12*
Sex (S)	87.11	1	87.11	.179
Residual Error	19386.93	40	484.67	
Interactions				
T X P	3646.70	6	607.78	2.07
T X S	459.17	3	153.05	.52
P X S	25.27	2	12.63	.043
T X P X S	2186.34	6	364.39	1.24

*Significant at the .05 level.

training irrespective of purpose for reading produced significant differences in average gains in reading speed; and similarly, type of reading purpose irrespective of training method produced significant differences in average gains in reading speed. There was, however, no significant interaction between these two variables which means that there were no consistent differential effects of type of training upon reading purpose or vice versa. No significant sex differences in reading time across periods were revealed by the analysis.

The average differences in time in seconds for reading three selections per subject are reported in Table 7 according to type of training for the three training periods. These data show that the group which focused major emphasis upon Reading to Find a Specific Fact achieved over the three training periods a much greater average reduction in reading time regardless of the purpose for reading and regardless of the fact that each group was tested upon and received some training in each of three purposes--Main Idea, Sequence and Specific Fact. Little difference may be noted in the average reduction in reading time among the other three training groups.

TABLE 7

AVERAGE DIFFERENCES IN READING TIME (IN SECONDS) ACROSS THREE TRAINING PERIODS ACCORDING TO TYPE OF TRAINING GROUP

	Type of Training Group			
	Balanced	Specific Fact	Main Idea	Sequence
Average Differences (in seconds)	17.84	32.26	20.33	20.16
Rank Order	4	1	2	3

If the basic data on average differences in reading speed across periods are now examined according to reading purpose irrespective of training groups, a well-defined rank ordering is observable as shown in Table 8. The greatest average gains (i.e., reduction) in reading time were found in Reading for the Main Idea, the next greatest in Reading to Find a Specific Fact, and the least in Reading for the Sequence of Ideas. It appears that the significant main effect noted for reading purpose across periods may be accounted for primarily by the greater improvement in efficiency in reading for the Main Idea and for Specific Fact than for Sequence of Ideas.

TABLE 8

AVERAGE DIFFERENCES IN READING TIME (IN SECONDS)
ACROSS THREE TRAINING PERIODS
ACCORDING TO READING PURPOSE

	Reading Purpose		
	Main Idea	Sequence	Specific Fact
Average Differences (in seconds)	29.35	16.47	22.12
Rank Order	1	3	2

A pertinent question at this point is whether or not these were differential effects according to period of training. Did period of training interact significantly with training group, reading purpose or sex? Were there periods of greater or less gain in reading speed?

To get at these questions, a second analysis of variance of the data was made to study the interaction of three periods of training with type of training, reading purpose and sex. The results of this analysis are given in Table 9.

TABLE 9

INTERACTION OF THREE PERIODS OF TRAINING WITH TYPE OF TRAINING, READING PURPOSE AND SEX, BASED UPON AVERAGE DIFFERENCES IN READING TIME (IN SECONDS) PER PERIOD FOR 48 FOURTH GRADE SUBJECTS

Sources	Sum of Squares	df	Mean Square	F
Training x Period	2794.69	6	465.78	.86
Period x Purpose	14740.67	4	3685.17	6.81**
Sex x Period	824.82	2	412.14	.76
Residual Error	43279.77	80	540.99	
Training x Purpose x Period	6885.55	12	573.80	1.49
Training x Sex x Period	1114.77	6	185.80	.48
Purpose x Sex x Period	1503.93	4	375.98	.98
Training x Purpose x Sex x Period	5321.11	12	443.43	1.15
Residual Error	61458.97	160	384.12	

**Significant at or beyond the .01 level.

While the previous analysis revealed a significant effect of type of training in reduction of reading time over a ten-day period, the analysis by periods showed no significant differences by period among training groups in this respect. Nor was a significant interaction found between training period and sex in average differences in reading time. However, average differences in reading speed according to purpose for reading were significantly affected by period of training at or beyond the .01 level. The nature and direction of these differences are shown in Table 10. For two reading purposes, Reading for the Main Idea and Reading to Find a Specific Fact, the greatest reading time gains occurred during the first period, a period which included a clarification of the reading purpose and task and required the reading of 15 selections. Such a pattern was not observable in Reading for the Sequence of Ideas in which relatively consistent but small gains were made in average reading time per period. These data confirm the results of the previous analysis in indicating that the purposes of reading for the Main Idea and for Specific Fact were more susceptible to training in reducing the time required to reach full comprehension than was Reading for the Sequence of Ideas.

Data on average sex differences in reading time for the three training periods irrespective of reading purpose or type of training as presented in Table 11 show that by far the greatest gains were made during the first period for both sexes separately and combined. Substantial gains were likewise made during the third period, but those during the second period were negligible. A contributing factor to the small gains in the second period may be the 2 -day interruption of practice over the weekend which occurred during this time period.

TABLE 10

AVERAGE DIFFERENCES IN READING TIME (IN SECONDS) FOR THREE TRAINING PERIODS ACCORDING TO READING PURPOSE IRRESPECTIVE OF TYPE OF TRAINING

Period	Reading Purpose		
	Main Idea	Sequence	Specific Fact
1	25.31	5.83	14.88
2	7.23	6.24	4.19
3	11.27	4.35	3.06

TABLE 11

AVERAGE SEX DIFFERENCES IN READING TIME (IN SECONDS) FOR THREE TRAINING PERIODS IRRESPECTIVE OF PURPOSE

Sex	Period		
	A First Period Pre-4th Day	B Second Period 4th Day-7th Day	C Third Period 7th Day-10th Day
Boys	11.6	2.9	5.7
Girls	17.5	.7	6.6
Combined	46.0	3.2	18.6
Rank Order	1	3	2

Discussion

The hypothesis that there would be a significant improvement in average reading speed for all training groups was thus upheld by the analysis of gain scores across three segments of the total training period irrespective of the purpose for reading. However, the prediction that the greatest improvement in average reading speed would occur in the training group with emphasis upon Reading to Find a Specific Fact and that the least improvement would occur in the group with emphasis upon Reading for the Sequence of Ideas was only partly confirmed. While the most dramatic gains were made by the Specific Fact training group, those made by the Balanced training group were actually slightly less than those made by the Sequence training group. While all groups received some training upon each of the three reading purposes and differed only in the proportional emphasis placed upon each, these results suggest that an equally distributed training emphasis is less effective than a more concentrated emphasis upon any one reading purpose during a short training period.

The hypothesis that improvement in average reading speed would be greatest for the purposes of Reading to Find a Specific Fact and least for that of Reading for the Sequence of Ideas was substantiated only with respect to the latter purpose which indeed showed the least improvement. The greatest average improvement in reading speed, however, was made in Reading for the Main Idea, substantially more in fact than in Reading to Find a Specific Fact. The extent to which possible differentials in pre-training effectiveness or response bias may have affected these results is not entirely clear, but it is gratifying to observe the marked improvement shown in so short a time by these subjects in so important a reading purpose as Reading for the Main Idea.

The hypothesis that there would be no significant sex differences in improvement in average reading time was upheld.

The final hypothesis of this portion of the study--that there would be no significant differences in improvement in average reading speed during the early, middle and later periods of training--was upheld with respect to training groups and sex but not with respect to reading purpose, the interaction between reading purpose and period being significant at the .01 level. The relatively large average reading time gains made in Reading for the Main Idea and in Reading to Find a Specific Fact during the first period were by far the greatest gains in the three periods measured. Thus for these two purposes the greatest improvement in average reading time occurred early, suggesting that subjects were able very rapidly to adjust their reading speed to these specific purposes. On the other hand, average increments in reading speed in Reading for the Sequence of Ideas were relatively small and stable from period to period. In view of these results, it would appear that appropriate modes of specifying training and testing for such purposes as Main Idea and Specific Fact may rather quickly produce marked improvement in the average reading speed for such purposes in children at this age level. However, if a more detailed and ordered type of comprehension is dictated by the purpose for reading, improvement in the speed of full comprehension may be expected to take place in more gradual and uniform increments across training periods.

Analysis of Pre-, Post- and Retention Test Differences

Hypotheses to be tested

Two major types of hypotheses were tested in this portion of the study:

1. The experimental training program will produce increased within-individual variability in reading speed according to purpose as measured by post-test and retention test performance.
    a. Individual variability will be significantly affected by type of training.
    b. Individual variability will differ significantly according to passage style.
    c. There will be no significant sex differences in individual variability.
2. The experimental training program will produce differences in reading speed according to purpose as measured by post-test and retention test performance.
    a. There will be significant differences associated with type of training.
    b. There will be significant differences according to passage style.
    c. There will be no significant differences according to sex.

Methodology

Design. The administration of common pre-, post-, and retention tests involving two passage styles, narrative and expository, for each of three purposes for reading yielded six reading time scores (in seconds) to full comprehension of the defined purposes for reading at each of these testing points for each of the 60 4th grade subjects in the five types of experimental training groups and for each of the 12 5th grade subjects in the control group. The objective of the analysis was to determine the effect of type of training, passage style, and sex upon variability in reading speed for defined purposes. Accordingly, an analysis of variance was first run upon pre-test scores to determine if there were significant initial differences in the performance of subjects. Since such differences were found, an analysis of covariance was then run upon pre - post and post - retention test scores to determine the effects of the experimental training program.

Method of Scoring. The score upon which analyses of data have thus far been conducted is time in seconds to reach full comprehension of the purpose for reading. Whether treated as average gain scores, as in the within-training-period analyses, or as words per minute scores, such scores are useful in variance analysis only to permit a mean reading speed for each purpose to be calculated and processed in a group analysis in relation to other relevant variables. However, if the relationship between two or more defined purposes is desired, a type of score which will preserve this relationship throughout the group analysis is desired.[1]

Therefore a score was sought which would describe the spread in reading speed among pairs of the three reading purposes--Sequence - Specific Fact, Main Idea - Specific Fact, and Sequence - Main Idea--and would maintain the spread score throughout the variance analysis. Ratios of reading time for these pairs of purposes were thought to provide appropriate indices of spread in reading speed according to purpose. Since the latter type of score described the spread of reading speeds according to purpose for the individual, it is designated as a within-individual variability score for reading speed in relation to reading purpose. Reading time scores or reading rate scores in words per minute are designated simply as reading speed scores. Both types of scores were subjected to group variance analysis.

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[1] It should be noted that the first method of scoring attempted in analyzing purpose variability was a time discrepancy score, algebraically summed, among the three reading purposes. However, it was found that an increase in the spread of reading times between two purposes might be sharply reduced or cancelled out by a relative loss in time spread between one of these purposes and a third one. Finally, this cancellation effect plus the compression in time scores for the three reading purposes after training was so great, as the within-period training results show, that the time discrepancy analysis revealed no differences in variability of reading speed according to purpose where the investigators had reason to believe that actual differences existed.

Since three reading purposes--Main Idea, Specific Fact and Sequence of Ideas--and two passage styles--narrative and expository--were included in the study, six indices[1] were computed per individual to represent the six sets of relationships between reading time and reading purpose. The six indices are shown below under the category of style:

Purpose Variability Index	Style	
	Narrative	Expository
S/SF	S/SF	S/SF
MI/SF	MI/SF	MI/SF
S/MI	S/MI	S/MI

The subsequent variance analyses sorted out and combined indices within the individual to provide the following scores:

1. Purpose: the mean of three time-purpose indices per individual representing the average of the two style indices. This score is designated as the Purpose Variability Index (PVI).

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[1] In the calculation of all indices, the first-mentioned purpose served as the numerator and the second-mentioned purpose the denominator. Thus for the index S/SF, the time for the Sequence purpose was divided by the time for the Specific Fact purpose.

2. Style: the two mean scores for the three time-purpose indices, one mean score for narrative style and one mean score for expository style.

3. Sex: the two mean scores, one for boys and one for girls, representing the average of each of the six time-purpose indices per individual.

One disadvantage of the use of a ratio score, however, is that it yields a relative rather than a definitive speed score such as time in seconds or a conventional rate score such as words per minute. Therefore, the first but not the second set of questions posed earlier can be answered by the use of such a score. For this reason, the latter questions relating to changes in reading speed according to reading purpose on the pre-, post- and retention tests will be examined through the use of two modes of speed scores, time in seconds and words per minute, to determine the extent of differences in reading speed produced by the training program irrespective of the relative variability of such speed within the individual. The analyses of three different ways o. scoring the same data should permit useful comparisons of the effect of method of scoring upon the results obtained and their interpretation.

Results of the Analyses of Purpose Variability Indices

Pre-Test Analysis of Variance Results. Table 12 reveals significant within-individual differences at the .01 level in the indices for purpose, passage style, and their interaction. No significant differences were found for type of training or for sex.

Figure 4 shows the pre-test means graphically for the above data found to be significant. The indices for the purpose of Specific Fact in relation to both Main Idea and Sequence are relatively high, whereas

TABLE 12

SUMMARY OF ANALYSIS OF VARIANCE OF PRE-TEST PURPOSE VARIABILITY INDICES FOR 72 4th GRADE SUBJECTS

Source of Variance	Sum of Squares	df	Mean Squares	F
Type of Training	9.638	5	1.9275	1.289
Sex	1.021	1	1.0208	<1
T x S_x	4.721	5	.9441	<1
Ss/T and S_x	89.679	60	1.4946	
Purpose Variability Index	41.906	2	20.9528	15.105**
Style	44.122	1	44.1216	31.810**
PVI x S_t	53.276	2	26.6378	19.204**
S_x x S_t	.345	1	.3445	<1
S_x x PVI	5.187	2	2.5935	1.869
T x S_t	8.530	5	1.7059	1.229
T x PVI	22.947	10	2.2946	1.653
S_x x T x S_t	3.830	5	.7660	<1
S_x x T x PVI	10.874	10	1.0873	<1
T x S_t x PVI	20.564	10	2.0564	1.482
S_x x S_t x PVI	1.724	2	.8619	<1
S_x x T x S_t x PVI	10.913	10	1.0912	<1
Ss/S_x and T/S_t and PVI	416.301	300	1.3876	
Total	1224.995	431		

** $p < .01$

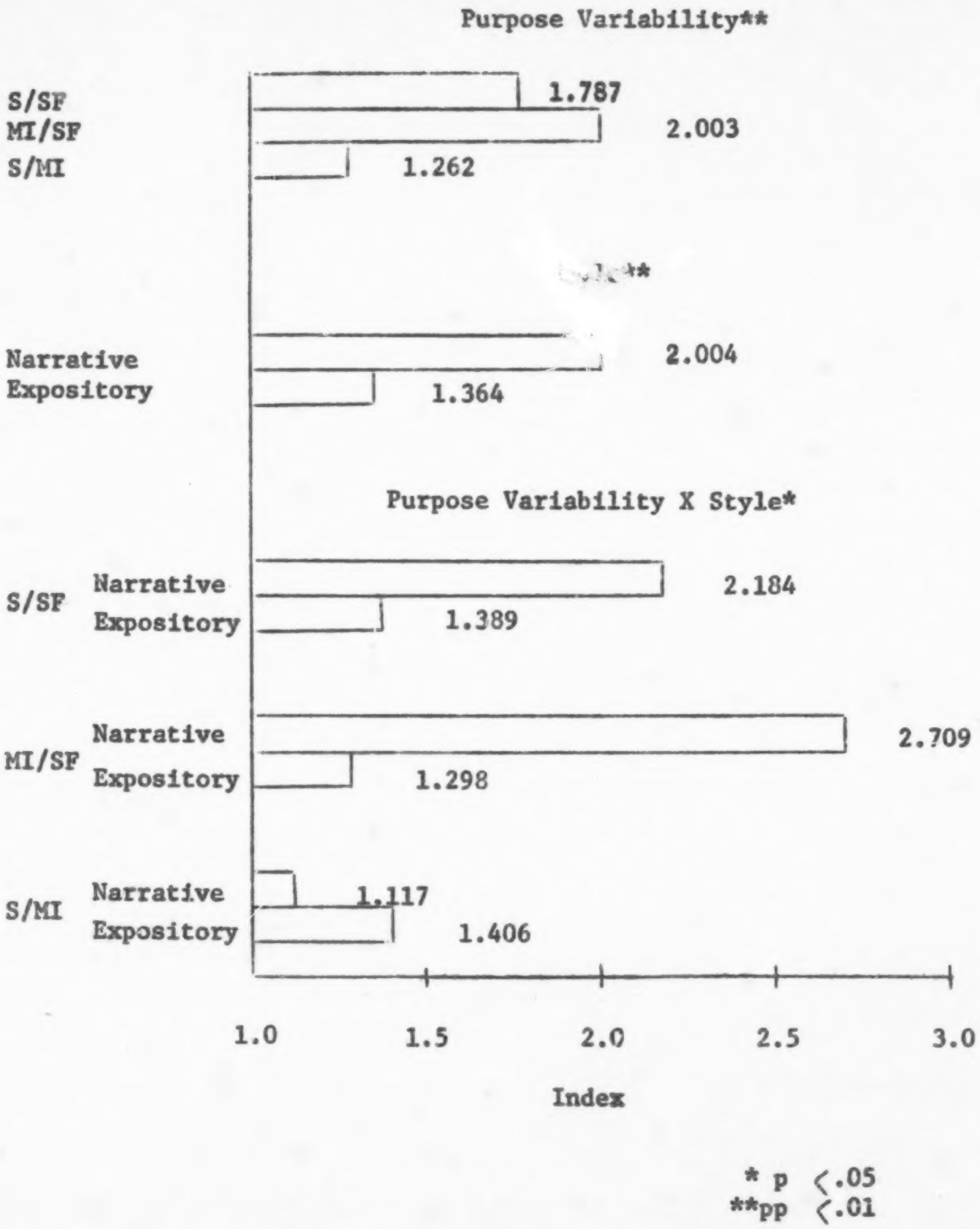


Fig. 4.--Mean pre-test purpose variability, passage style and the interaction between the variables for 72 4th grade subjects.

that for Main Idea in relation to Sequence is relatively low. The Scheffé test indicated that the following indices were significantly different at the .05 level: S/SF versus S/MI; MI/SF versus S/MI; MI/SF versus S/SF and S/MI; and S/MI versus S/SF and MI/SF. Thus the relative speed for Specific Fact in relation to sequence was considerable greater than the relative speed for Main Idea in relation to Sequence.

Figure 4 likewise shows that within-individual speed variability according to purpose was substantially greater on the average for narrative than for expository style. However, the interaction of purpose and style reveals greater variability in reading narrative passages for Specific Fact than expository passages for Sequence or Main Idea. On the other hand, there was greater variability in reading expository materials for the Main Idea than in reading narrative materials for Sequence.

It may be concluded from this analysis that subjects, after a very brief introduction to the nature of these purposes prior to the pre-test tasks, initially displayed considerable within-individual variability in adapting their speed of reading to three specified purposes and reacted differently, though not always consistently, to the influence of passage style.

Pre - Post and Post - Retention Analysis of Covariance Results. Table 13 shows the following results:

1. Type of training was significant at the .05 level on the post-test and at the .01 level on the retention test. While no significant differences were found between any training groups or between any one training group and the control group according to t test analysis, the mean adjusted indices for the control group (pre - post, 1.2513, and post - retention, 1.338) are materially lower than those of any of the

TABLE 13

SUMMARY OF ANALYSIS OF COVARIANCE FOR PRE - POST AND POST - RETENTION PURPOSE VARIABILITY INDICES FOR 72 4TH GRADE SUBJECTS

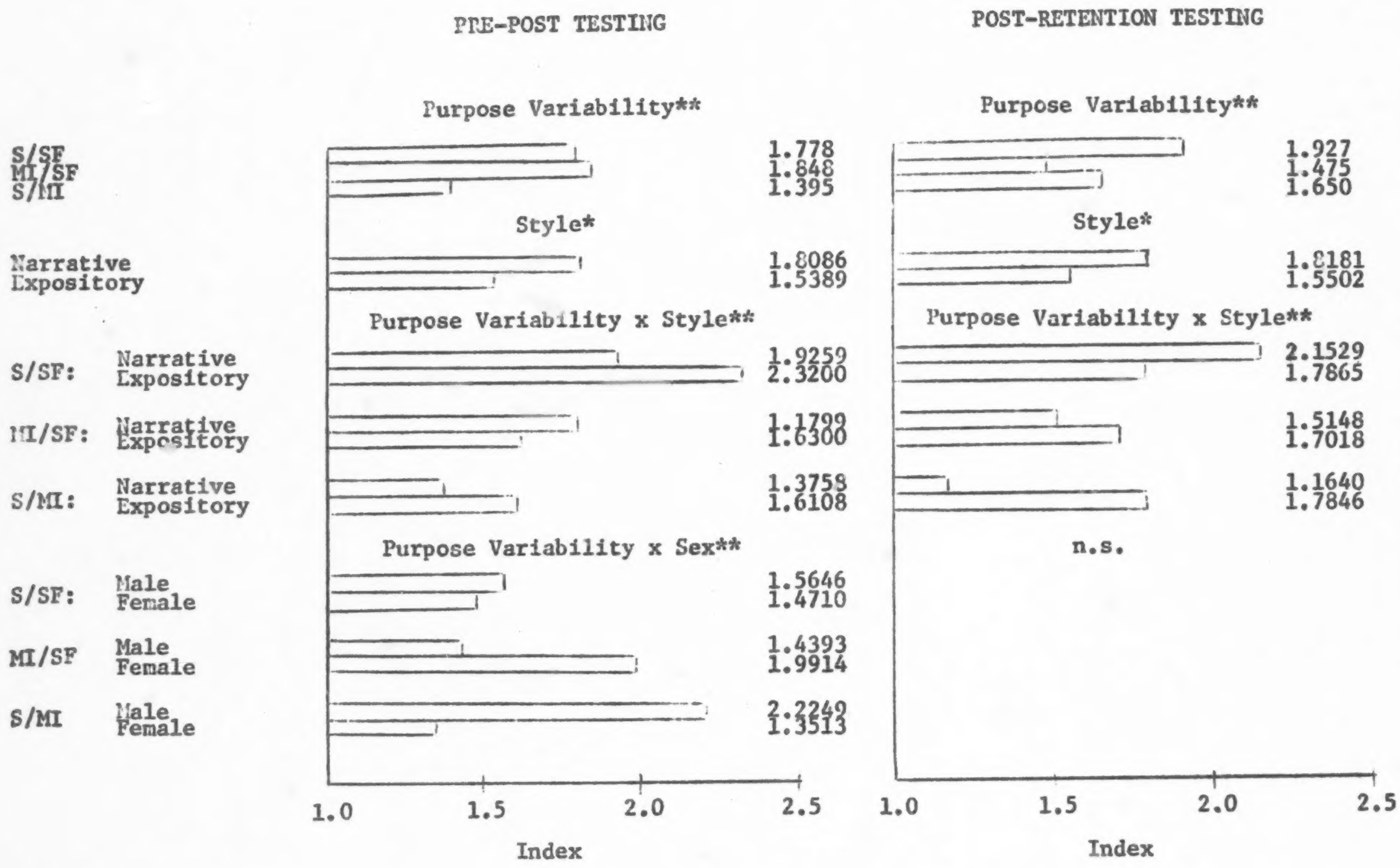
Source of Variance	df	F(Pre - Post)	F(Post - Retention)
Type of Training	5	2.3142*	3.5628**
Sex	1	9.9249**	2.7931
T x S_x	5	2.6537*	2.2665*
Purpose Variability Indices	2	5.4044**	7.5567**
Style	1	4.9334*	7.6037**
S_t x PVI	2	10.5109**	7.4590**
S_x x S_t	1	.8734	1.1250
S_x x PVI	2	4.4881**	1.1871
T x S_t	5	.6428	.1559
T x PVI	10	.6481	1.0016
S_x x T x S_t	5	.3375	.8074
S_x x T x PVI	10	.3010	1.0207
S_x x S_t x PVI	2	1.3604	1.0627
T x S_t x PVI	10	.4831	.6660
S_x x T x S_t x PVI	10	.4258	.3366

* $p < .05$
** $p < .01$

experimental training groups, the lowest of the latter being the post-retention index of 1.5196 for the Balanced training emphasis group. The significant effect due to training must therefore be attributed to greater spread in time-purpose variability for combinations of training groups compared to that for the control group. While sex was a significant differential (.01) on the post-test only, at which time within-individual PVIs were greater for girls than for boys, there was nevertheless a significant interaction (.05) between type of training group and sex at both testing points. Thus boys showed more within-individual purpose variability in some training groups and girls in others.

2. The PVI was significant (.01) at both post- and retention testing points. Passage style was likewise significantly different on the post-test (.05) and retention test (.01), with a significant interaction (.01) between the PVI and style at both testing periods. A further interaction between the PVI and sex was significant (.01) only on the post-tests.

3. Figure 5 shows graphically the adjusted means upon which certain of these differences are based. The Scheffé test, accepting the .10 level of significance, showed that only the PVIs of S/MI versus S/SF and MI/SF on the post-test and S/SF versus MI/SF and S/MI on the retention test were significant. Although the pattern of adjusted average indices for style was similar within and across testing periods, narrative style showing the greater within-subject variability, the interaction between purpose and style differed on the pre - post and post - retention tests. The interaction between purpose and sex (.01) on the post-test may be seen in the reversed performance (higher variability) of girls on the MI/SF index, boys possessing the higher



* p <.05
** p <.01

Fig. 5.--Adjusted mean time-purpose indices and interactions for Pre-Post and Post-Retention testing for 72 4th grade subjects.

within-individual variability in other comparisons.

Purpose Variability Means (Uncorrected) on Pre-, Post- and Retention Tests. Table 14 shows the uncorrected mean PVIs according to purpose and type of training group at the three testing points. It will be noted that the uncorrected post- and retention test means are very similar to the adjusted means given in Figure 5. The scores for purpose show that two indices tend to become larger from pre- to post- to retention testing, the within-individual variability for Specific Fact and for Main Idea in relation to Sequence. On the other hand, such variability is reduced for Main Idea in relation to Specific Fact. Since these indices are actually the ratios of the mean reading time for one purpose to another per individual averaged for the 72 subjects of the study, it may be concluded that the reading speeds for the purposes of Specific Fact and Main Idea are moving farther apart from the reading speed for Sequence and at the same time are moving closer together from pre- to post- to retention testing.

While no significant differences were found in the mean within-individual PVIs according to type of training group at any point in the analyses of variance, several points should be noted. No index for the control group is as large (pre- 1.538) as that for any experimental training group at any point save that for retention (1.537) in the Balanced emphasis group. Thus the highest index which also suggests some degree of within-individual variability in time in relation to purpose was found initially in the control group and is comparable to the lowest index found in retention testing in the experimental groups. The reduced PVIs in the control group on the post-test (1.235) and retention test (1.270) likewise show relatively little average within-individual

TABLE 14

MEAN PURPOSE VARIABILITY INDICES ACCORDING TO PURPOSE AND TYPE OF TRAINING GROUP OBTAINED ON PRE-, POST-, AND RETENTION TESTING FOR 72 4th GRADE SUBJECTS

Testing	Purpose		
	S/SF	MI/SF	S/MI
Pre-**	1.787	2.003	1.262
Post-**	1.790	1.885	1.347
Retention**	1.944	1.506	1.602

Testing	Type of Training					
	Balanced	Specific Fact	Main Idea	Sequence	Self-Selection	Control
Pre-	1.977	1.586	1.598	1.771	1.634	1.538
Post-	1,794	1.812	1.655	1.731	1.815	1.235
Retention	1.537	1.789	1.949	1.712	1.847	1.270

** $p < .01$

variability as they approach close to a ratio of 1.0. Among the training groups, two showed a definite pattern of increased variability, the Main Idea and Self-Selection emphasis groups; one showed a relatively stable pattern, the Sequence emphasis group; one showed a declining pattern of variability, the Balanced emphasis group; and one showed a strong rise in variability after training with a slight decline upon retention, the Specific Fact emphasis group. Thus while there was some variation in the growth of average within-individual purpose variability according to training group, there appears to be evidence that training over a period of time produced a higher degree of average time-purpose variability than was found among untrained subjects.

Results of the Analyses of Total Reading Time (in Seconds) Scores

Pre-Test Analysis of Variance Results. The summary of the pre-test variance analysis of total time (in seconds) shown in Table 15 reveals that only reading purpose and the interaction of style x purpose were significant at the .01 level. Contrary to the results of the pre-test variance analysis of PVIs, style was not significant, the mean times for reading narrative and expository passages to full comprehension being 34.3 and 35.2 seconds respectively. Average time differences according to reading purpose were, in order of relative speed from fastest to slowest: Specific Fact, 27.5 seconds; Sequence, 36.7 seconds; and Main Idea, 40.1 seconds. Application of the Scheffé test showed that only reading speed for the Specific Fact purpose versus those for Main Idea and Sequence was significant at the .05 level.

The pre-test results indicated that analysis of covariance should be used to assess the pre - post and post - retention test differences which are reported next.

Pre - Post and Post - Retention Analysis of Covariance Results. Table 16 shows that several effects were significant at both the pre - post and post - retention testing: type of training (.01), sex (.01), purpose (.01), style (.01), and style x purpose (.01, .05). The sex x purpose

TABLE 15

SUMMARY OF ANALYSIS OF VARIANCE OF PRE-TEST READING TIME SCORES (IN SECONDS) FOR 72 4th GRADE SUBJECTS

Source of Variance	Sum of Squares	df	Mean Squares	F
Type of Training	9328.817	5	1865.7634	1.553
Sex	2735.113	1	2735.1134	2.276
T x S_x	3922.095	5	784.4189	<1
Ss/T and S_x	72082.972	60	1201.3828	
Purpose	12159.130	2	6079.5648	17.367**
Style	91.669	1	91.6689	<1
P x S_t	12276.907	2	6138.4537	17.535**
S_x x S_t	17.521	1	17.5208	<1
S_x x P	306.463	2	153.2314	<1
T x S_t	1029.317	5	205.8634	<1
T x P	6602.593	10	660.2592	1.886
S_x x T x S_t	1561.910	5	312.3819	<1
S_x x T x P	3365.870	10	336.5870	<1
T x S_t x P	5024.148	10	502.4148	1.435
S_x x S_t x P	228.500	2	114.2500	<1
S_x x T x S_t x P	2378.944	10	237.8944	<1
Ss/S_x and T/S_t and P	105016.528	300	350.0550	
Total	521736.502	431		

** $p < .01$

TABLE 16

SUMMARY OF ANALYSIS OF COVARIANCE FOR PRE - POST AND POST - RETENTION TOTAL READING TIME SCORES (IN SECONDS) FOR 72 4TH GRADE SUBJECTS

Source of Variance	df	F(Pre - Post)	F(Post - Retention)
Type of Training	5	25.0665**	9.2236**
Sex	1	15.3618**	20.7408**
T x S_x	5	2.1060	1.3132
Purpose	2	16.9566**	21.3023**
Style	1	41.1819**	9.6792**
P x S_t	2	9.2513**	3.4666*
S_x x S_t	1	.5281	.4625
S_x x P	2	7.5986**	.6590
T x S_t	5	.5491	.0988
T x P	10	1.5967	1.1994
S_x x T x S_t	5	.1248	.6183
S_x x T x P	10	.8735	1.3621
S_x x S_t x P	2	.9180	2.2256
T x S_t x P	10	.5743	.2469
S_x x T x S_t x P	10	.1419	.7352

* $p < .05$
** $p < .01$

interaction was significant at the .01 level only on pre - post testing.

Upon examination of certain of the adjusted mean total time scores, it can be stated that:

1. For type of training, while the performance of no one training group was significantly better than another, the differences between training groups and the control group substantially favored the former at both testing points.

2. Boys read faster than girls at both testing points.

3. For purpose, at the pre - post testing, reading for Specific Fact was fastest, that for Sequence next fastest and that for Main Idea the slowest. The Scheffé test revealed a significant difference at the .05 level for time for reading for the Specific Fact purpose versus Main Idea and Sequence purposes. On the post - retention testing, reading for Specific Fact was fastest, next that for Main Idea, and that for Sequence the slowest. At this point the Scheffé test showed time for reading for the Sequence purpose versus the Main Idea and Specific Fact purposes to be significantly different at the .05 level. There was thus a shift in the relative reading speeds according to purpose at the two testing points. The sex x purpose interaction on pre - post testing showed a systematic sex difference in reading speed according to purpose, the girls reading faster than boys for the Main Idea, the boys on the other hand being the faster readers for the other purposes.

4. Expository passage style was read faster than narrative style on the average at both testing points for Main Idea and Specific Fact but not for Sequence.

Mean Total Time (in Seconds) on Pre-, Post- and Retention Tests. Table 17 shows the mean total time pre-, post- and retention scores for purpose and for type of training as well as differences in pre - post and post - retention scores. The pre - post reduction in mean total time is greatest for Main Idea (15.4 seconds) and least for Specific Fact (11.5 seconds), the post - retention reduction similarly being the greatest for Main Idea (9.0 seconds). Such average reductions in reading time in a short training period are sizable. Similarly substantial pre - post reductions in mean reading time irrespective of purpose may be seen in the scores by type of training groups, which range from 12.7 seconds to 20.4 seconds in the experimental group against a 4.5 second reduction in the control group. Thus there was from three to five times as much reduction in mean total reading time in experimental groups as there was in the control group. While the control group had the greatest average time reduction from the post- to the retention test (9.8 seconds), its final average reading time (26.2 seconds) was almost 10 seconds slower than that for any experimental training group.

Results of the Analyses of Words Per Minute Scores

Pre-Test Analysis of Variance Results. Table 18 indicates that only reading purpose and its interaction with style were significant (.01). Average words per minute differences according to reading purpose were, in order of relative speed, fastest to slowest: Specific Fact, 213 words per minute; Main Idea, 145 words per minute; and Sequence, 137 words per minute. The Scheffé test showed that only the difference for the purposes of Specific Fact versus Main Idea and Sequence was significant (.05). The interaction of purpose x style showed that while the average speed

TABLE 17

MEAN TOTAL TIME (IN SECONDS) ACCORDING TO PURPOSE AND TYPE OF TRAINING OBTAINED ON PRE-, POST- AND RETENTION TESTING OF 72 4TH GRADE SUBJECTS

Testing	Purpose		
	MI	SF	S
Pre-**	40.063	27.507	36.688
Post-**	24.674	15.979	22.875
Pre - Post Differences	15.389	11.528	13.813
Retention**	15.646	11.743	19.104
Post - Retention Differences	9.028	4.236	3.771

Testing	Type of Training					
	Balanced	Specific Fact	Main Idea	Sequence	Self-Selection	Control
Pre-	30.875	42.583	32.500	32.944	30.069	39.542
Post-**	16.069	22.153	17.944	20.278	15.569	35.042
Pre - Post Differences	14.806	20.430	14.556	12.666	14.500	4.500
Retention**	12.389	15.694	13.639	14.264	11.792	25.208
Post-Retention Differences	3.680	6.459	4.305	6.014	3.777	9.834

** $p < .01$

TABLE 18

SUMMARY OF ANALYSIS OF VARIANCE OF PRE-TEST WORDS PER MINUTE SCORES FOR 72 4th GRADE SUBJECTS

Source of Variance	Sum of Squares	df	Mean Squares	F
Type of Training	164080.852	5	32816.1703	1.348
Sex	14630.083	1	14630.0832	<1
T x S_x	87608.945	5	17521.7889	<1
Ss/T and S_x	1459622.000	60	24327.0333	
Purpose	504032.088	2	252016.0439	34.408**
Style	9259.259	1	9259.2592	<1
P x S_t	302075.699	2	151037.8496	20.621**
S_x x S_t	2465.333	1	2465.3332	<1
S_x x P	28515.542	2	14257.7708	1.946
T x S_t	5975.380	5	1191.4759	<1
T x P	147884.107	10	14788.4106	2.019
S_x x T x S_t	20775.583	5	4155.1166	<1
S_x x T x P	76932.930	10	7693.2930	1.050
T x S_t x P	90351.662	10	9035.1661	1.233
S_x x S_t x P	2789.542	2	1394.7708	<1
S_x x T x S_t x P	72871.542	10	7287.1541	<1
Ss/S_x and T/S_t and P	2197277.000	300	7324.2566	
Total	11756580.454	431		

** $p < .01$

in words per minute for Specific Fact and Main Idea purposes was greater for narrative than for expository materials, the latter style was read faster for Sequence.

Pre - Post and Post - Retention Analysis of Covariance Results. Table 19 shows that the following effects were significant at both pre - post and post - retention testing: type of training (.01), sex (.01), purpose (.01), style (.01), style x purpose (.01), and training x purpose (.05, .01). In addition, training x sex was significant (.01) at post - retention testing, purpose x sex (.05) at pre - post testing only.

An examination of certain of the adjusted mean words per minute scores indicated that:

1. For type of training, the higher adjusted mean words per minute scores at both points favored the experimental training group as a whole over the control group but not any one training group over another. Similarly, boys read faster on the average than girls at both testing points but only in the following training emphasis groups: Balanced, Main Idea, Sequence, Self-Selection and Control. The training x sex interaction was significant (.01) only on retention testing.

2. For purpose, that for Specific Fact was read the fastest, Main Idea next fastest and Sequence the slowest at both points. The Scheffé test showed the following significant purpose differences at the .05 level: pre - post, SF versus MI and S, and S versus MI and SF; post - retention, SF versus S, SF versus MI and S, and S versus MI and SF.

3. Expository passage style was likewise read faster on the average at both points for the Main Idea and Specific Fact, whereas narrative materials were read more rapidly for Sequence.

TABLE 19

SUMMARY OF ANALYSIS OF COVARIANCE FOR PRE - POST AND POST - RETENTION WORDS PER MINUTE SCORES FOR 72 4TH GRADE SUBJECTS

Source of Variance	df	F(Pre - Post)	F(Post - Retention)
Type of Training	5	19.4317**	19.9240**
Sex	1	8.6285**	33.1994**
T x S_x	5	1.9900	3.2082**
Purpose	2	23.1149**	46.8234**
Style	1	24.3415**	27.6596**
P x S_t	2	10.2379**	11.7694**
S_x x S_t	1	.5348	.2580
S_x x P	2	4.6949*	.1316
T x S_t	5	.5250	.8734
T x P	10	1.9060*	3.2558**
S_x x T x S_t	5	.2867	.5150
S_x x T x P	10	1.3091	1.4032
T x S_t x P	10	1.0842	.6531
S_x x S_t x P	2	.6064	.7248
S_x x T x S_t x P	10	1.0192	.4135

* $p < .05$

** $p < .01$

Words Per Minute Means (Uncorrected) on Pre-, Post- and Retention Tests. Table 20 shows the mean words per minute pre-, post- and retention scores for purpose and for type of training and the pre - post and post - retention differences. It will be noted that the average pre - post gains for purpose were greater for Specific Fact than for Main Idea and least for Sequence, but the post - retention gains were much greater for Main Idea than for Specific Fact. Average words per minute gains thus were substantial, though variable, for each reading purpose and continued to increase through the retention testing period. Similarly, average words per minute gains irrespective of purpose were large, being over 100 words per minute at the end of training for each of the training emphasis groups and showing further increase on the retention tests. Relative words per minute gains, however, for the control group were very slight.

Discussion

The two types of scores used in these group analyses--one an index designed to show the relative spread of reading speed within the individual according to reading purpose, and the other designed to show speed changes according to purpose either as total reading time or as reading rate in words per minute--reveal some general similarities as well as certain differences according to the summary of patterns of probability values for the analyses of covariance shown in Table 21. Both types of scores show the significant effects of the experimental training on differences in average reading speed for different purposes upon post- and retention test. Both show that average reading speed at both of these testing points was definitely influenced by reading purpose and

TABLE 20

MEAN WORDS PER MINUTE ACCORDING TO PURPOSE AND TYPE OF TRAINING OBTAINED ON PRE-, POST- AND RETENTION TESTING FOR 72 4th GRADE SUBJECTS

Testing	Purpose		
	MI	SF	S
Pre-**	144.549	213.090	137.264
Post-**	277.674	359.188	232.542
Pre-Post Differences	133.125	145.098	95.278
Retention**	415.792	466.229	278.368
Post-Retention Differences	282.567	107.041	45.826

Testing	Type of Training					
	Balanced	Specific Fact	Main Idea	Sequence	Self-Selection	Control
Pre-	182.889	142.944	172.903	180.042	177.917	133.111
Post-*	342.319	295.528	318.306	304.708	335.569	142.375
Pre-Post Differences	159.430	152.584	146.103	124.666	157.652	9.264
Retention*	410.278	400.264	432.194	416.403	467.083	194.556
Post-Retention Differences	67.959	104.736	113.888	111.695	131.514	52.181

* p < .05

** p < .01

TABLE 21

COMPARATIVE PROBABILITY VALUES OF MAIN EFFECTS AND INTERACTIONS OBTAINED IN THE COVARIANCE ANALYSES FOR THREE TYPES OF SCORES--PURPOSE VARIABILITY INDICES, TOTAL READING TIME AND WORDS PER MINUTE--FOR 72 4TH GRADE SUBJECTS

Source of Variance	Within-Individual		Group			
	Purpose Variability Indices		Total Reading Time		Words Per minute	
	Pre - Post	Post - Retention	Pre - Post	Post - Retention	Pre - Post	Post - Retention
Training	.05	.01	.01	.01	.01	.01
Sex	.01	n.s.	.01	.01	.01	.01
T x S_x	.05	.05	n.s.	n.s.	n.s.	.01
Purpose[a]	.01	.01	.01	.01	.01	.01
Style	.05[b]	.01	.01[c]	.01	.01[c]	.01
P x S_t[a]	.01	.01	.01	.05	.01	.01
S_x x P	.01	n.s.	.01	n.s.	.05	n.s.
T x P	n.s.	n.s.	n.s.	n.s.	.05	.01

[a] Significant at the .01 level of significance on all pre-test analysis of variance.

[b] Significant at the .01 level on the pre-test analysis of variance.

[c] Not significant on the pre-test analysis of variance.

by style of materials and that there was an interaction between these two variables. While both types of scores show that sex interacted with purpose to a significant degree only upon post-testing, the influence of sex was otherwise not at all consistent either in the probability pattern for the two types of scores in post- and retention testing or in its interaction with training. A significant interaction between training and purpose was found only in the words per minute analysis of covariance. It should also be noted that style was found to be a significant variable only in the pre-test analysis of variance for within-individual variability and not in that for the analysis of variance of reading speeds.

Consideration of the mean scores upon which certain of these differences are based reveals other differences which affect interpretation of the data. For example, girls usually showed greater average time-purpose variability than boys, yet the average reading speeds for boys as a group were faster than those for girls. Similarly, within-individual variability for passage style was on the average greater for narrative materials than for expository materials, yet the average reading speed for expository materials was usually the faster. Differences in the results for the two modes of analysis of reading speed, total time (in seconds) and words per minute, may also be observed in the comparisons of rank ordering of data shown in Table 22, which is based upon the uncorrected means reported in Tables 17 and 20. Note the discrepancy in the rank ordering for purpose obtained by the use of raw scores versus converted scores. Thus on a total time basis, Reading for the Main Idea is on the average the slowest on the pre- and post-tests but the second fastest on the retention test, whereas in the words per minute analysis it is the second fastest reading rate at each testing point. On the other hand, the rank ordering of average reading speeds according to type of training reveals a clear-cut and consistent pattern in the total time analysis

TABLE 22

COMPARISON OF RANK ORDERING OF UNCORRECTED AVERAGE READING SPEEDS FROM HIGHEST TO LOWEST ON PRE-, POST- AND RETENTION TESTS FOR TOTAL TIME (IN SECONDS) AND WORDS PER MINUTE ACCORDING TO PURPOSE AND TRAINING EMPHASIS FOR 72 4TH GRADE SUBJECTS

Test	Purpose					
	Total Time			Words Per Minute		
	MI	SF	S	MI	SF	S
Pre-	3	1	2	2	1	3
Post-	3	1	2	2	1	3
Retention	2	1	3	2	1	3

Test	Training											
	B	SF	MI	S	SS	C	B	SF	MI	S	SS	C
Pre-	2	6	3	4	1	5	1	5	4	2	3	6
Post-	2	5	3	4	1	6	1	5	3	4	2	6
Retention	2	5	3	4	1	6	4	5	2	3	1	6

which is somewhat obscured when raw time scores are converted into words per minute.

What do these findings reveal with respect to the hypotheses stated for this portion of the study? The first general hypothesis that the experimental training program would produce increased within-individual variability or spread in reading speed according to purpose upon post- and retention testing was confirmed for the experimental subjects in view of the significant PVI (.01) obtained by the covariance analysis upon pre - post and post - retention testing. The real significance of this finding is in those changes which took place after training in the pattern of reading speeds relative to the three purposes for reading: average speed for the Specific Fact and Main Idea purposes increased in relation to that for Sequence, while at the same time the increased average speed for the Main Idea purpose was approaching more closely that of the Specific Fact purpose. While the hypothesis that individual time-purpose variability would be significantly affected by type of training was not upheld, the experimental training groups as a whole showed significantly more variability in adjusting reading speed to reading purpose than did the control group upon post- and retention testing. The hypothesis that such variability would differ according to passage style was upheld at both testing points, but the hypothesis of no sex differences in time-purpose variability was rejected upon post-testing and upheld only upon retention testing.

The second general hypothesis that the experimental training program would produce differences in reading speed according to purpose upon post- and retention testing was likewise confirmed according to the pre - post and post - retention analyses of covariance results. The shift in reading speed patterns according to purpose which was found after training in the time-purpose ratio analysis was in general confirmed by the words per minute analysis but not by the total time analysis. Likewise, while no one type of training was found to be significantly better than another, the experimental groups adjusted and increased their reading speeds relative to purpose significantly more than did the control group upon post- and retention testing. The hypothesis that there would be significant differences according to passage style was also upheld at both testing points, while the hypothesis that there would be no significant sex differences was rejected according to the results of both post- and retention testing.

These findings suggest that when the ratio of one reading speed to another within the individual rather than reading speed alone is the referent for examining the question of variability in reading speed according to purpose, conclusions drawn for one type of score will not necessarily hold for the other in group analyses with respect to the influence of pertinent variables and their interactions. It is the position of the investigators that the individual is the proper referent in considering the question of variability in reading speed for different purposes. The findings of this study suggest that under appropriate task conditions, individual variability in the adjustment of reading speed to reading purpose may be demonstrated among good readers at the 4th grade level when speed is defined as the time taken to reach full comprehension of a given purpose. Furthermore, training significantly alters the pattern of within-individual variability even though reading speed increases sharply and differentially for narrative and expository styles of writing and to a certain extent for boys and girls. The rather substantial retention results likewise suggest the possibility of positive transfer effects of the experimental training to school tasks.

While the implications of this study are necessarily limited by the relatively short selection length and by the initial level of reading skill possessed by its population, the investigation nevertheless offers encouraging evidence for the appropriate adjustment of reading speed to reading purpose at least by the 4th grade level. If reading purposes are clearly understood, if comprehension for a defined purpose and that alone is the criterion of speed of comprehension, and if total time over trials is accepted as the working speed of comprehension score, 4th grade pupils who possess well-developed basic reading skills may quickly and rather easily be taught to vary their individual reading speeds relative to their reading purpose more efficiently through one or more of several training emphases.

Summary

The analysis of within-period training differences showed that there was a significant improvement in average reading speed for all training groups[1] and for the purposes of Main Idea and Specific Fact especially during the first third of the training period. The analysis of pre-, post- and retention results showed that the initial pattern of within-individual variability in the adjustment of reading speed to reading purpose changed as a result of training and remained significant while marked reductions in average reading speeds were being achieved on the post-test of 39 per cent for Main Idea, 42 per cent for Specific Fact, and 38 per cent for Sequence purposes. Evidence was also secured that style of materials had a consistent yet differential effect upon the adjustment of speed to reading purpose, as did sex. General support for these findings was also found in analyses of reading speed changes in terms of total reading time and in rate in words per minute, although certain discrepancies resulting from the use of these modes of scoring were also noted.

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[1] Except for the Self-Selection emphasis group, which was not included in this analysis.

CHAPTER IV BIBLIOGRAPHY

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CHAPTER V

CHILDREN'S PERCEPTION OF THE READING TASK

Previous studies by the Laboratory for Research in Basic Skills have indicated, as noted in Chapter I, that how children perceive the demands of a task appears to be an important determinant of how they perform the task. In the present project, the task involved the reading of certain materials for specified purposes under conditions in which the time taken to achieve full comprehension was recorded. It was anticipated that such aspects of the task influence the subject's performance and that some evidence of his perception of the tasks could be obtained by suitable inventories. A further and crucial purpose of this investigation was to secure evidence of change with respect to the fourth major hypothesis of the study: that children in the 4th grade will show improvement in their perception of the reading task by learning to predict their speed of reading for different purposes more realistically (accurately) after training than before training. If such evidence could be secured, it was thought that it might indicate the extent to which the subject's set toward the task, i.e., his adaptation of a speed appropriate to his purpose for reading, was altered as a result of training. For this reason, a level of aspiration task was introduced in the training phase of the project.

In the first portion of this chapter the results of a brief inventory of pupil reaction to the initial experimental testing are reported.

The latter portion of the chapter is devoted to the findings with respect to changes in level of aspiration as a result of training, and to the pupil's perception of his adjustment of reading speed to reading purpose and of his enjoyment of the task.

Children's Perceptions of the Experimental Test Materials and of Their Speed of Reading

The inventory used at the time of the initial experimental testing provided three alternative choices to each of four questions relating to pupil interest in the materials, his familiarity with them, his assessment of his reading speed for these materials relative to his usual reading speed, and his perception of the difficulty of the materials. (See Appendix B.) This inventory was administered to each of 128 4th grade subjects involved in the experimental testing immediately after the two narrative test selections, Ducks and Pioneer Adventure, and the two expository test selections, Sheep and Caves, were read.

The distribution of responses to each of the inventory questions across selections is shown in percentages in Table 23. With very few exceptions, the test selections were judged interesting or very interesting, as column 4 indicates. Similarly, the selections were even more predominantly judged to be easy to read or of only usual difficulty, only one student rating any one selection hard to read. Since there was a 9 to 15 per cent failure according to type of training group in the satisfactory completion of the reading test selections in five trials, and since the majority of subjects required more than one trial to reach full comprehension, it seems clear that their perception of the difficulty of the selections was not necessarily related to their success on the assigned task.

Over three-quarters of the pupils judged their speed of reading to be "at my usual speed" or "faster than usual," although a small minority of responses were in the "slower than usual" category. The responses to the question on the familiarity of the material, however, were much more mixed than those to any other question on the inventory. One selection, Ducks, was judged to be more unfamiliar than familiar, while the content of the selection, Sheep, was judged to be fairly or very familiar by three-quarters of the subjects. A slight majority of the subjects judged the selections Pioneer Adventure and Caves to be more familiar than unfamiliar.

While it is difficult to ascertain at any time the exact bases upon which judgments of familiarity are made in reading, it is highly probable that these bases varied from selection to selection in the present task. The selection Ducks, which was rated unfamiliar by most subjects, had a somewhat unique plot and surprise ending to which a slight majority of subjects apparently reacted rather uniformly in labelling it unfamiliar. However, the story entitled Pioneer Adventure may have had a particular plot line that was judged unfamiliar by many but was possibly a general type of pioneering story judged familiar by a slight majority. Similarly, although the specific content of the selection Caves was considered unfamiliar by 43.8 per cent of the subjects and very familiar by 10.2 per cent, the 46.1 per cent of the subjects judging it to be fairly familiar may possibly reflect acquaintance with partial information on how a cave develops, with similar descriptions of the formation of features of the earth, or with merely a general type of scientific explanation. Of the four selections, however, the selection Sheep best fits the textbook stereotype of relatively familiar content: the herder takes the sheep

TABLE 23

PERCENTAGES OF RESPONSES TO TEST INVENTORY ITEMS ACROSS SELECTIONS FOR 256 4TH GRADE PUPILS

	1	2	3	4
Selection	Interest			
	Very Interesting	Interesting	Uninteresting	Sum of Columns 1 & 2
Ducks	31.5%	86.9%	1.6%	98.4%
Pioneer Adventure	27.1	86.7	6.2	93.6
Sheep	29.7	59.4	10.9	89.1
Caves	39.1	57.8	3.1	96.9
Selection	Speed			
	Faster	Usual	Slower	Sum of Columns 1 & 2
Ducks	11.0	73.2	15.7	84.2
Pioneer Adventure	17.1	60.5	22.5	77.6
Sheep	21.1	65.6	13.3	86.7
Caves	16.4	64.8	18.8	81.2
Selection	Familiarity			
	Very	Fairly	Unfamiliar	Sum of Columns 1 & 2
Ducks	14.2	30.7	55.1	44.0
Pioneer Adventure	17.1	38.0	45.0	55.1
Sheep	35.9	39.8	24.2	75.7
Caves	10.2	46.1	43.8	56.3
Selection	Difficulty			
	Easy	Usual	Hard	Sum of Columns 1 & 2
Ducks	59.8	39.4	.8	99.2
Pioneer Adventure	56.6	42.6	.8	99.2
Sheep	47.7	51.6	.8	99.3
Caves	47.7	51.6	.8	99.3

up to mountain pastures and down again for shearing. Pupils clearly judged this episode the most familiar.

Thus the selections as a whole appeared to be perceived by the subjects as interesting, not difficult to read, varying in degree of familiarity, and appropriate for their usual or even faster speeds of of reading. The extent to which the response patterns to each question varied across selections may be seen in the results of the Chi square analysis shown in Table 24. Highly significant differences at the .001 level were found in judgments of familiarity from selection to selection as the preceding discussion would suggest. The response patterns of judgments of interest were also significantly different at the .02 level among selections, but those with respect to perceived difficulty and reading speed among selections were substantially the same and hence non-significant.

A further question remains, however, as to the correspondence of these pupil perceptions to the actual speed at which they read the test selections. In order to assess this relationship, a series of Chi square analyses were performed in which the subject's reading speed according to upper, middle and lower stanines were plotted against his pattern of response to the four questions asked.

A summary of results of the Chi square analysis is given in Table 25. The results show that in 15 of the 16 analyses there were no significant differences in the way in which pupils reading at relatively slower or faster speeds rated the selections on the four investigations. In other words, pupil perception of the reading task and materials on the whole was remarkably similar regardless of how long it took them to read the selection.

TABLE 24

CHI SQUARE ANALYSIS OF RESPONSE PATTERNS TO EXPERIMENTAL TEST INVENTORY ITEMS ACROSS SELECTIONS

Selection	Interest ($X^2 = 16.5389$*)		
	Very Interesting	Interesting	Uninteresting
Ducks	40	85	2
Pioneer Adventure	35	86	8
Sheep	38	76	14
Caves	50	74	4

Selection	Speed (n.s.)		
	Faster	Usual	Slower
Ducks	14	93	20
Pioneer Adventure	22	78	29
Sheep	27	84	17
Caves	21	83	24

Selection	Familiarity ($X^2 = 45.1110$***)		
	Very	Fairly	Unfamiliar
Ducks	18	39	70
Pioneer Adventure	22	49	58
Sheep	46	51	31
Caves	13	59	56

Selection	Difficulty (n.s.)		
	Easy	Usual	Hard
Ducks	76	50	1
Pioneer Adventure	73	55	1
Sheep	61	66	1
Caves	61	66	1

df = (r-1) (c-1) = 6

*$p < .02$
***$p < .001$

TABLE 25

SUMMARY OF CHI SQUARE ANALYSIS OF THE RELATIONSHIP BETWEEN READING TIME AND FOUR ASPECTS OF PUPIL PERCEPTION IN READING FOUR EXPERIMENTAL TEST SELECTIONS

SELECTION	QUESTION	CHI SQUARE VALUE	df
0 (Ducks)	1 (Interest)	3.6264	4
	2 (Speed)	3.8505	4
	3 (Familiarity)	10.6041*	4
	4 (Difficulty)	1.1997	4
1 (Pioneer Adventure)	1	7.9859	4
	2	1.8342	4
	3	2.0065	4
	4	3.5576	4
2 (Sheep)	1	6.2027	4
	2	2.5335	4
	3	7.8660	4
	4	1.2165	4
3 (Caves)	1	3.9472	4
	2	3.5265	4
	3	6.4012	4
	4	6.4739	4

*$p < .05$ $(X^2 = 9.488)$

The one exception again was the judgment of the familiarity of the selection Ducks for which a significant difference at the .05 level was found in pupil ratings according to reading time. An examination of the ratings on familiarity for this selection showed that while a majority of pupils judged the content to be relatively unfamiliar, the largest group rating it thus was the group whose reading speed was in the middle third of the stanine scores. This suggests that there was no selective bias in the direction of faster or slower reading speed influencing pupil ratings of familiarity. It may thus be concluded that for these test selections as a whole there was a high degree of comparability in pupil perceptions of them irrespective of the reading speed of the pupils.

On the basis of pupil perceptions of the experimental test, the selections were accordingly judged by the investigators to be of an appropriate level of difficulty, to be reasonably interesting, to represent tolerable limits of familiarity, and to permit some variability in reading speed. Steps were therefore taken to prepare further materials with similar characteristics for training purposes.

Children's Perception of the Reading Task and Materials in the Training Program

Procedure

To answer the question of whether or not children would become more realistic (accurate) in predicting their reading speed for different purposes as a result of training and hence alter their perception of the reading task, a modified level of aspiration task was initiated on the second day of the study.[1] Each subject was given a large graph on which he plotted his reading rate scores which were supplied by the examiner for each of the three purposes for which he read that day. On the 3rd day each subject was taught to use a conversion table to change his reading time scores into words per minute scores. Before reading his first selection, he was asked to estimate how fast he planned to read for the purpose indicated and to designate that estimate or prediction on the graph with a colored X. This predicted speed was considered his level of aspiration. The subject then read, converted his reading time score to a words per minute score, and plotted his actual reading score on the same ordinate as the estimate with a dot of the corresponding color.

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[1] For the purpose of this study, Frank's definition of level of aspiration was accepted: "the level of future performance in a familiar task which an individual, knowing his level of past performance in that task, explicitly undertakes to reach." [Frank, J. D. "Individual Differences in Certain Aspects of the Level of Aspiration," American Journal of Psychology, XLVII (1935), 119-28.]

After their first 3 days of training, the pupils in the first four groups were assigned selections by number. (The 25 selections written for each purpose were numbered.) Vertical lines on the Time Record Sheets for the members of the first four groups were numbered to correspond with the numbers of the selections assigned to be read. For example: members of the Balanced group had three training selections and three test selections daily, two for each of the three purposes. Selections were randomly ordered. Members of the three groups which had one particular emphasis had three training selections for only one specified purpose and then had three test selections, one for each of the three purposes. The members of the fifth, or Self-Selection group, read similar test selections, one for each purpose, on the first and last (4th and 10th) days of the period. At all other times, they chose their own selections from all the remaining "test" and training selections according to the following directions:

1. Look at your graph and decide for what purpose you wish to read your next story.

2. Choose a selection for that purpose.
3. Circle the number of that selection on the list.
4. Get the selection from the box.
5. Put the number on your Time Record Sheet.
6. Read the yellow direction sheet and do what it tells you to do.
7. When you finish, study your graph and decide on the purpose for your next selection.

The yellow direction sheet to which Item 6 refers gave the title of the selection, stated the purpose for which the pupils were to read, and asked pupils to place their guess of the number of words they could read for this purpose on their Time Record Sheets. (Samples of similar yellow direction sheets are included in the pre-tests included in Appendix G.)

This meant that each child made six estimations or approximations of the number of words he would read per minute, or, in other words, set six levels of aspiration. The last three selections read each day by all pupils except those in the Self-Selection group were "test" selections which were for the three purposes, were of similar length (66 words) and were randomly selected.

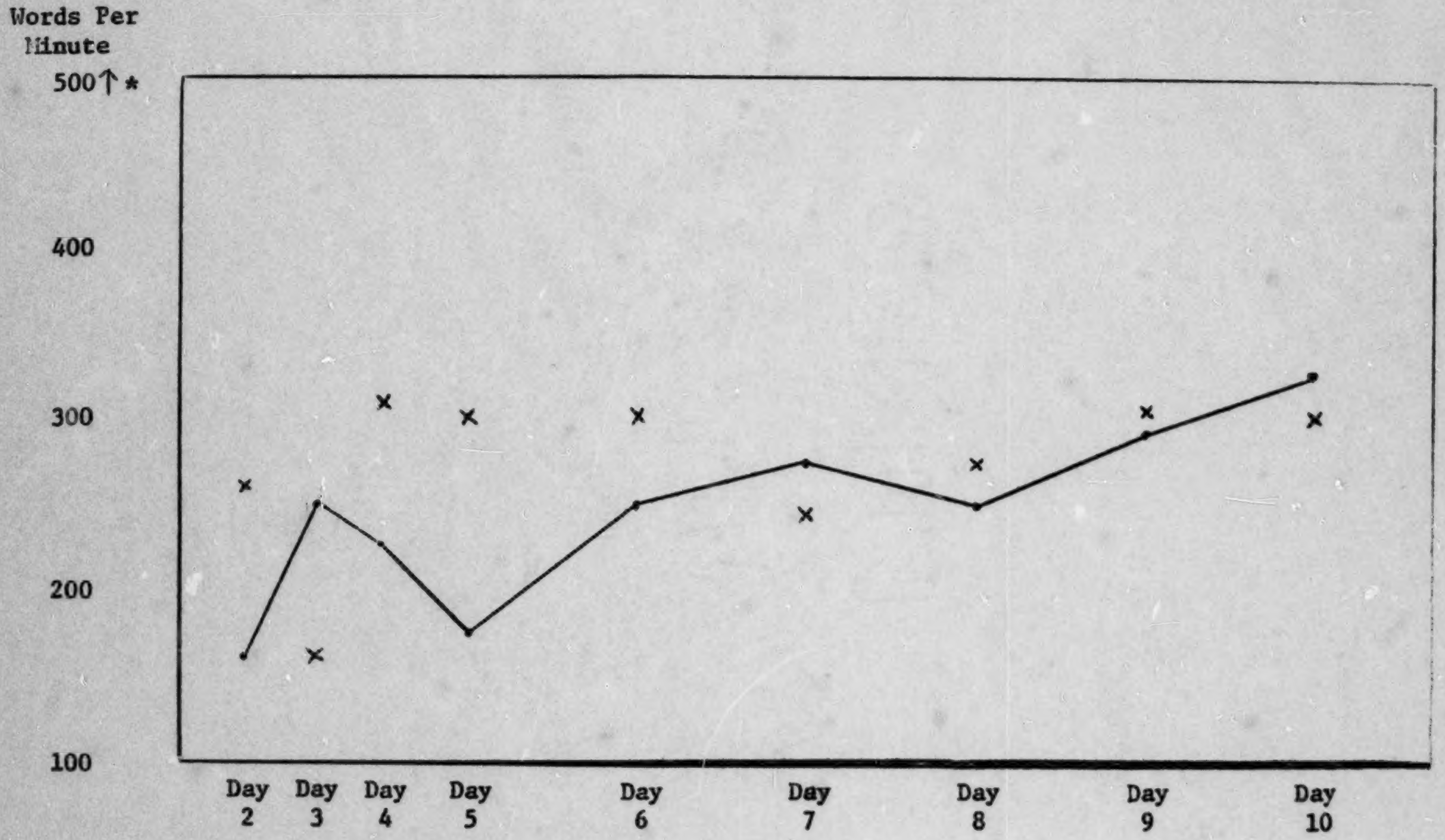
Predicted and attained rates of reading were plotted each day for each of the six selections read. The difference between the predicted and attained rates of reading yielded attainment discrepancy scores which were calculated for each selection on which subjects were asked to make predictions. This aspect of the task was strictly individualized. At no time were comparisons made by the research and teaching assistants of one child's work with another and no group results were at any time revealed to the subjects. Furthermore, the task of estimating was construed as self-motivational, no attempts being made to discuss with the subject his levels of estimated and actual performance.

Figure 6 provides a simulated illustration of one child's actual and predicted scores and the discrepancies between these scores for one purpose over the training period. The X's, which illustrate the child's predictions in this illustration, become increasingly more accurate, i.e., closer to the dots which represent his actual reading rate, over the training period.

By administering the inventory, shown on page 145, at the close of each daily session, further information about individual perceptions of the task was collected. After completing his six selections each day, each subject was asked to indicate what he thought or felt about each question by placing an X on a line. These data provided answers to questions about how well each child liked the tasks and how each perceived his adjustment of reading rates to reading purposes.

Thus, the over-all question was defined operationally by asking the three following sub-questions:

1. Do children's predictions of their reading speed become more realistic (accurate) for the different purposes over the training period?
2. Do children's perceptions of their adjustment for purposes vary between training groups:
    a. on over-all adjustment,
    b. on adjustment for reading for Main Idea,
    c. on adjustment for reading for Sequence, or
    d. on adjustment for reading for Specific Fact?
3. Are there differences between training groups for children's perceptions of how much they enjoyed the training tasks?



*Words per minute were extended to 1500 on original graphs.

Fig. 6 .--Sample graph showing discrepancies between actual and predictive speeds for one child for one reading purpose, sequence, over the training period.

Name________________________

Date________________________

HOW MUCH?

Directions: Put an X on each line to show what you think or feel.

1. Did you enjoy what you did here today?

____

Very little Very much

2. Did you adjust your reading rate for different purposes today?

____

Very little Very much

3. Was your planned reading speed today like your actual reading speed for the main idea?

____

Very little Very much

4. Was your planned reading speed today like your actual reading speed to remember the right order?

____

Very little Very much

5. Was your planned reading speed today like your actual reading speed to find a specific fact?

____

Very little Very much

Results

To answer question 1, Kruskal-Wallis one way analyses of variance of attainment discrepancies for each of the three reading purposes over the training period were computed. A significant increase over time in accuracy of predicting speed of reading for Sequence tasks was found (H = 17.27; significant at the .01 level). Figure 6, page 144, can be used to illustrate this finding. No significant changes over time in accuracy of predicting speed of reading for Specific Fact and Main Idea tasks were found.

Thus, the hypothesis that subjects' predictions would become more realistic (accurate) over the training period was substantiated for only one of the three purposes--Reading for Sequence of Ideas, or for the order in which things happened.

To answer questions 2 and 3, responses from the subjects' daily inventories were tabulated. A 29-point grid was placed on the line and the position marked by each child was recorded. These data were then analyzed, using the Kruskal-Wallis technique.

For question 2a, significant differences between groups were found regarding the extent to which training group subjects felt they were adjusting their reading rates to different purposes (H = 16.56; significant at the .01 level). In descending order of self-rated adjustment, the groups ranked as follows : (1) Main Idea, (2) Sequence, (3) Balanced, (4) Self-Selection, and (5) Specific Fact.

Significant differences between groups were also found on training group subjects' judgments that their predicted reading speed was like their actual reading speed when Reading to Find a Specific Fact (Question 2d: H = 9.92; significant at the .05 level). In descending order, the groups ranked as follows: (1) Self-Selection, (2) Main Idea, (3) Balanced, (4) Specific Fact and (5) Sequence. No significant group differences were found on similar judgments pertaining to selections read for the Main Idea (Question 2b) or to find the Sequence of Ideas (Question 2c).

Application of the Kruskal-Wallis test to inventory data which rated task enjoyment (Question 3) yielded significant differences between groups ($H = 12.38$; significant at the .02 level). In descending order of task enjoyment, the groups ranked as follows: (1) tie between Self-Selection and Main Idea, (3) Specific Fact, (4) Balanced and (5) Sequence.

Discussion

The finding that children's prediction of reading speed for given purposes became more realistic when reading for Sequence appears to be a reasonable one. The sequencing task most closely approximated the kind of reading demanded in many school situations and was therefore more familiar and more easily predictable in terms of reading speed than were the other reading purposes. The nature of the sequencing task also consistently demanded careful reading of the complete paragraph, whereas this was not always necessary and thus less predictable of time needed when reading for Main Idea or Specific Fact purposes. The fact that more realistic predictions for the latter tasks did not occur would suggest the desirability of a longer training period and/or more experience with reading for these kinds of purposes.

Variation between training groups in their perception of their overall adjustment of speed to purpose and in their specific perception of adjustment of speed to reading for Specific Fact presents some evidence of the differential effect of the various training groups upon the perception of the group members.

The difference in liking or satisfaction between the various training groups is interesting. The order of satisfaction is notable in that the Self-Selection and Main Idea groups contrasted dramatically with the lowest group--Sequence. Therefore we might surmise that both Main Idea and Self-Selection training procedures were more novel and thus more stimulating than reading for Sequence procedures. It is interesting to note the similarity between the rank order of training groups for overall enjoyment of the reading task and the rank order of group performance scores on the final retention test (see Table 14). They are identical, with one exception--a reversal of fourth and fifth positions. The relationship between task enjoyment and retention of task learning would seem to merit further study in future investigations.

It is apparent that the results of this study add further credence to the earlier findings from previous studies by the Laboratory for Research in Basic Skills, which indicated that how children perceive a task is an important determinant of how they perform the task. The finding that the ability to predict more realistically in reading for Sequence is in direct agreement with this generalization, provided that one accepts the condition that youngsters are more familiar with reading for this purpose.

CHAPTER VI

PSYCHOLOGICAL TENSION AS A CORRELATE OF READING TEST PERFORMANCE IN CHILDREN

Reading for defined purposes requires attentive effort. Under reading test conditions particularly, the reader may be under considerable psychological stress. It is reasonable to believe that the resulting psychological tension is a function of several factors such as the newness or difficulty of the material, the demands made upon the reader in terms of the speed and comprehension expected, and the sense of satisfaction or frustration felt by the reader during the reading task. Logically one might advance the hypothesis that the psychological tension under which an individual performs a mental task, such as reading, is a factor of some consequence in the level of performance attained. While this investigation is not designed to test this hypothesis directly, our observation should provide inferential findings bearing on this question.

The basic purpose of this aspect of the investigation is to determine whether psychological tension as measured here is related to reading test performance of 4th grade children. More specifically the following hypothesis will be tested:

1. Tension states vary within the individual with the difficulty of the reading task--the more difficult the task, as reflected in slow reading performance, the higher the tension level.

2. Repetition of a reading task because of failure to complete the

task satisfactorily results in an increase in the tension state.

3. Tension states in children tend to be higher during the process of reading than under subsequent recall test conditions.

The Psychological Manifestations of Tension and Anxiety: A Review

It is widely recognized that the affective state in man is peculiarly sensitive to a broad range of internal and external stimuli, being at the lowest level in sleep and reaching maximum levels under conditions of extreme pain, anger, or psychological stress. It is also clear that relatively mild feelings of apprehension, annoyance, frustration, embarrassment, and elation bring on certain physiological responses which can be measured with sensitive recording instruments. For the most part these physiological responses faithfully reflect alterations in the affective state of the individual, responses over which he has no direct volitional control. Thus, the increased heart rate and blood pressure of individuals in an apprehensive state are indicative of a heightened level of activity of the autonomic nervous system, nature's mechanism for automatically regulating the level of activation of the body as a whole.

Extensive research has been underway for some time to learn more about the nature of psychological stress, its physiological manifestations, and appropriate methods for its assessment. There is general agreement that a variety of physiological functions, chiefly those under the control of the autonomic nervous system, are highly sensitive to relatively minor alterations in the organism's affective state. The exact purpose of these responses is not entirely clear, although is is generally held that the response is primitive in nature, preparatory for action and self-protection

[Mundy-Castle and McKiever (13)]. Support for this point of view lies in the fact that the vast majority of the physiological responses brought on by heightened autonomic activity do in fact mobilize the body's reserves for action. Thus, under stress the heart rate, blood pressure and breathing increase and the blood sugar level rises. Similarly, it has been demonstrated that there are endocrine adaptations to emotional tension, resulting in alterations in the eosinophil count and an increase in ketosteroid output [Dreyfuss and Feldman (4); Mann and Lehmann (12)].

In addition to the autonomic responses just described, there are responses of a volitional nature indicative of the organism's readiness to respond, namely an increase in the general level of muscle tension. Heightened muscular tension has been repeatedly demonstrated in the augmented reflexes of individuals in highly attentive and apprehensive states. Thus, measures of muscle tension provide another means of studying the stressful nature of mental tasks which have emotional overtones.

The Galvanic Skin Response

Perhaps the simplest and most frequently used method of assessing alterations in the affective state in humans is the galvanic skin response (GSR). Essentially this is a measure of the secretory activity of the sweat glands and reflects in a large measure the level of activity of the autonomic nervous system. The evidence indicates that innervation of the sweat glands is exclusively sympathetic [Lindsley (10) and Wang (17)]. Since the palms of the hands and the palmer surface of the fingers are richly supplied with sweat glands, the GSR is usually taken here. While the exact significance of the GSR is not fully established, there is general agreement that the response is highly sensitive to conditions of stress and anxiety [Darrow (1)].

While considerable research has been devoted to refining the measurement of the GSR and to measuring defined conditions of anxiety and psychological stress, only limited study has been made of the affective state of subjects in a learning situation, particularly with children of elementary school age. In general, in studies in which subjects are exerting mental effort (simple arithmetic addition) show that changes in GSR are largely a function of apprehension, intense mental work, relief or adaptation to the task [Davis (2)]. There is rather clear-cut evidence that repeated experiments on the same subjects or prolonged within-day experimentation results in an adaptation to the task and a diminished GSR [Duffy and Lacey (5); Mundy-Castle and McKiever (13)]. In other words, the GSR is in part a function of the intensity and newness of the situation. The GSR is therefore primarily a measure of the degree to which the stimuli arouse autonomic responses. The early work of Prideaux (14) demonstrated that there was an increase in skin conductance during mental work, in adding and in learning nonsense syllables. Wechsler (18) reported that the largest GSR occurred at the moment the problem was attacked and at the time the answer was given rather than during the actual arithmetical work. Sears (16) observed that the magnitude of the GSR tended to parallel the relative difficulty of hard and easy psychological judgments, being greater for the difficult and less for the easy judgments. Similarly, the present investigators noted considerable correspondence between the GSR, general muscle tension, and handwriting speed and legibility of children, for as handwriting legibility deteriorated with increases in writing speed, the GSR responses and muscle tension for most subjects increased [Harris and Rarick (7)]. Thus, there is considerable evidence that the GSR does provide useful objective evidence of the affective state of the individual in mental and psychomotor tasks, particularly if the tasks are demanding and ones in which the individual has something at stake.

The extent to which the GSR reflects other autonomic responses presumed to be indicative of psychological stress is not entirely clear. The work of Mandler and Kremen (11) and Lacey and Lacey (8) showed a general lack of relationship among indices presumed to measure autonomic functions. On the other hand, the recent work of Lazarus et al. (9) reported a correlation of .545 between heart rate and GSR in a group of 50 subjects in which the stressor situation was caused to wax and wane systematically over a period of time. The difference in the findings of the earlier investigators and that of Lazarus et al., lies in the fact that the observations of the latter investigators are based on repeated measures of the same subjects with systematic alterations in the stressor situation.

Muscle Action Potentials

Considerable research has been done to determine whether muscular tension as recorded by electromyography faithfully reflects the level of difficulty in psychomotor tasks, mental effort, and alterations in affective state. The rationale underlying the use of muscular tension as an indirect objective measure of this phenomenon is that a certain level of alertness and attention preparatory to response is necessary if the individual is to respond effectively, and this readiness is evidenced by slight but measurable contractions in skeletal muscles. While the research is not in complete agreement, there is considerable evidence in support of the above. For example, Freeman (6) reported that neuromuscular spread or general muscle tension does occur during mental work, but the spread of neuromuscular excitation is inversely related to the learning score. Davis (3), observing changes in MAP from neck and arm muscles in students engaged in mental arithmetic, found that with increased difficulty of task the action potentials increased correspondingly. Our own work [Harris and Rarick (7)] indicated that as the demands of a writing task become more rigorous, requiring an increase in writing speed, muscular tension in the non-writing arm and the neck muscles tends to increase. There is also evidence that distracting influences during mental work increase muscular tension [Ryan et al. (15)]. Thus, there is good reason to believe that muscular tension is related to the difficulty of the task, to distractions which may accompany the task, and possibly to the level of performance.

Methodology

Subjects

The technical problems associated with the collection of the physiological data made it impossible to collect these measures in the local school situation. Hence, subjects included in this phase of the study were transported by cab to the Basic Skills Laboratory at the University of Wisconsin. The somewhat lengthy procedures involved in preparing subjects for the collection of the physiological data, and the problem of transporting children to and from the laboratory limited the number of subjects upon whom observations could be made. The method of selecting the subjects for the laboratory procedures is described on page 85. The laboratory-tested group included a total of 32 children, 16 boys and 16 girls. Each subject was brought to the laboratory twice for testing, once for the pre-test and a second time at the end of the two weeks experimental training program. With the exception of the laboratory setting the initial and final testing procedures were identical to those followed in the classroom (see Chapter IV).

The Laboratory Testing Procedures

Each child was tested individually in a small electrically shielded booth 6 ft. x 6 ft. x 6 ft. The area was sufficiently large for the subject and the test administrator to sit at a small table which held the reading material, and upon which the subject could comfortably rest his arms. The testing conditions were uniformly free of noise and distracting influences. A Gilson Eight Channel Polygraph located adjacent to the testing booth provided a continuous record of the subject' psychophysiological responses.

For the purposes of this investigation two psychophysiological measures were used--the galvanic skin response and muscle action potentials.

The rationale for the use of these two measures as indices of alterations in the affective state has been outlined in an early part of this chapter. The limitations of these measures are recognized, but they are perhaps the most suitable for use with children.

Skin contact for the GSR recording was made by means of metallic electrodes (1 cm. x 1 1/2 cm.) anchored by adhesive tape to the volar surface of the distal phalanx of the index and middle fingers of the left hand. Zinc sulphate-kaolin paste was spread on the contact surface of the electrode just prior to securing it in place.

Contacts for the electromyography consisted of 8 mm. silver disc electrodes filled with electrode paste and anchored to the skin with adhesive tape. The electrodes were placed approximately 1 1/2 inches apart on the dorsal surface of the right forearm over the extensor communis digitorum parallel to the longitudinal axis of the muscle in an area approximately 2 inches below the elbow. Each subject was asked to grasp a pencil in the normal writing position throughout all reading tasks. This procedure was followed to reduce subconscious movements of the hands and fingers, such as drumming of the fingers and clenching of the fist. While some of the action potential records had to be discarded because of observable hand movements, the procedure of having the children grasp the pencil served to reduce extraneous movements. The electromyographic data could not be used under the answer conditions because of the overt movements involved in checking the answer sheets.

The procedures for administering the reading tasks were the same as those described in an earlier section of the report, the only difference being that the children were tested individually in the laboratory. In order to indicate on the write out record the moment when the child started and stopped reading, and in turn when he began and stopped work on the answer sheet, the examiner in the booth fed a signal into the recorder through an attached strain gauge pressure mechanism. Thus the recorder provided a written record which synchronized the GSR, the MAP, and identified these records with the corresponding reading and answer tasks. (See Figure 7 for sample record.)

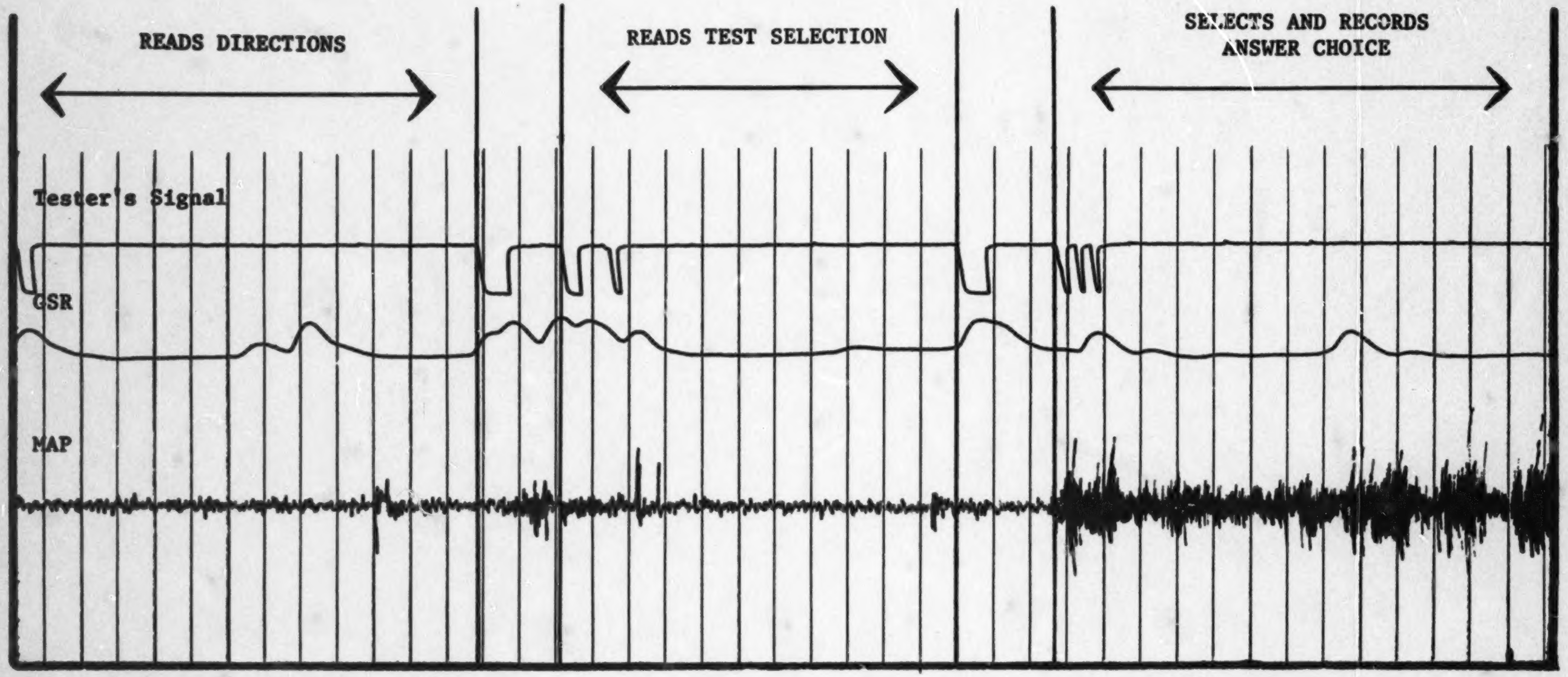


Fig. 7.--Sample record of a subject's galvanic skin responses and muscle action potentials under reading test conditions.

Method of Scoring the Data

One of the major problems in research using psychophysiological measures of the type used here is that of quantifying the data in a valid and meaningful way. Our basic purpose was to relate change in the GSR and MAP within the individual to his own reading performance. Thus, quantification of the records was for the purpose of determining changes in these measures within the individual during a single laboratory testing period and not for comparisons between individuals or between the same individual's performances at two different testing periods.

Two approaches were used in quantifying the GSR data. One was to measure with a planimeter the area under the GSR curve for each reading and answer condition and divide the area in square centimeters by the length of the base line (in centimeters). The maximum deflection (in millimeters) from the base under each trial condition was also measured. A correlation of .91 between the two systems of scoring based on some 30 records indicated that one method could be substituted for the other. A major portion of the analysis used the maximum deflection as the score. The method of quantifying the electromyographic data involved measurements of the heights of the deflections (in millimeters) from the base line for each task. The values were then totalled for each trial condition and the total divided by the length of the base line. Thus, for each trial on each selection there was a GSR score and a MAP score.

Between subject comparisons of quantified GSR and MAP measures are subject to question, even though the techniques are well standardized. Hence, correlation analyses involving reading performance and the psychophysiological measures were restricted to a within-individual and within-day basis. Reading time scores, GSR and MAP data for each subject within a given task were converted to rank scores as the basis for computing Kendall coefficients of concordance and Spearmen rank difference correlations. Since the number of trials per reading task varied from one to five, the GSR raw score for a specific reading task was the average height of the maximum deflections of the respective trials. The MAP score for a given reading task was the average of the values of the separate trials. Within-subject GSR and MAP scores were ranked from highest to lowest with a rank of 1 assigned to the highest and the other ranks assigned accordingly. Within-subject reading times for the six tasks were ranked from the greatest to the least time with a rank of 1 being assigned to the task requiring the longest time and the other five ranked accordingly. Hence, each subject had six ranked GSR scores, six ranked MAP scores, and six ranked scores for reading time.

The logic for the above ordering of the data was based upon the assumption that for a given child, the task which is most difficult for him will require the longest reading time. Hypothetically, speed of reading should be associated with physiological measures of tension. The analysis of the data was designed to test the hypothesis that slow reading, which is presumably difficult, is associated with greater evidence of tension within the subject than is rapid reading.

Findings

The findings of this aspect of the investigation will be presented in three parts: (1) Tension and the difficulty of the reading task; (2) Tension under reading and subsequent recall test conditions; and (3) Reading task failure and tension in subsequent reading test trials.

Tension and the Difficulty of the Reading Task

Frequency distributions of within-subject rank order correlations between reading time and GSR and MAP responses are given in Table 26. It is clear from the wide range of correlations that there were marked differences among individuals in response patterns, the correlations in a few instances being above .90 and in others as low as -.70. The median correlations for GSR and for MAP by testing period ranged from .05 to .30. It is clear that although a few subjects showed a high relationship between the separate measures of tension and the difficulty of the reading task as defined by speed of reading, the correlations for the most part ranged from .60 to -.40. Thus, for most individuals it can be concluded that tension and difficulty of the reading task are not related.

If, on the other hand, one raises the question regarding the correspondence between the difficulty of the reading task (defined by reading time) and the relative magnitude of the respective psychophysiological responses across subjects, a somewhat different picture is obtained. As may be noted in Table 27, the number of cases who showed high psychophysiological responses (rank 1-2) in the reading task requiring the longest time is substantially greater than the number showing high responses in the task read in the shortest time. It is equally clear that the number of subjects exhibiting relatively low tension (rank 5-6) in the selection on which they took the least time was materially greater than the number showing low tension in the task read most slowly. Chi square tests applied to the data in the contingency tables show that under both pre-test and post-test conditions the distribution of cases classified according to the three categories of physiological tension and according to the dichotomy of reading time differed significantly from chance ($p < .001$).

TABLE 26

FREQUENCY TABULATION OF WITHIN-SUBJECT RANK ORDER CORRELATIONS BETWEEN READING TIME AND TWO PSYCHOPHYSIOLOGICAL MEASURES UNDER PRE-TEST AND POST-TEST CONDITIONS

Correlation Coefficients	Pre-Test		Post-Test	
	GSR-RT	MAP-RT	GSR-RT	MAP-RT
Positive Correlations				
.80 to 1.00	2	2	3	4
.60 to .79	3	1	3	2
.40 to .59	3	3	6	5
.20 to .39	6	1	1	5
.00 to .19	5	5	3	5
Negative Correlations				
.00 to - .19	6	3	4	2
-.20 to - .39	5	6	5	2
-.40 to - .59	0	1	5	0
-.60 to - .79	1	1	0	2
-.80 to -1.00	0	0	0	0

It should be pointed out that while the results of these two analyses on the surface seem inconsistent, they are attacking the problem in a somewhat different way. The results of the correlation analysis show that if one uses all the scores and confines the analysis to the individual, the relationships vary markedly among individuals, but in general tend to be

TABLE 27

CORRESPONDENCE BETWEEN READING TIME AND RELATIVE MAGNITUDE OF THE PSYCHOPHYSIOLOGICAL RESPONSES UNDER PRE-TEST AND POST-TEST CONDITIONS*

Psychophysiological Variables	Reading Time	Pre-Test			Post-Test		
		High	Medium	Low	High	Medium	Low
M A P	Slowest	10	10	3	16	8	3
	Fastest	6	3	14	7	9	11
G S R	Slowest	15	15	1	15	14	1
	Fastest	4	8	19	5	13	12

MAP Pre-Test $X^2 = 18.55$; $p < .001$ MAP Post-Test $X^2 = 10.97$; $p < .001$

GSR Pre-Test $X^2 = 97.23$; $p < .001$ GSR Post-Test $X^2 = 39.45$; $p < .001$

* Frequency tabulations in high, medium, and low categories in the above contingency tables are based on within-subject rankings of the psychophysiological measures for the six reading tasks. The high category includes the number of subjects with rank scores of 5 or 6, the medium category, those with ranks of 3 or 4, and the low category, those with ranks of 1 or 2.

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low. On the other hand, if one is interested in looking at the extremes, in this case responses in only the fastest and slowest reading tasks, there is definite correspondence between the apparent difficulty of the task and tension.

The possibility that there might be systematic alterations in GSR and MAP responses due to adaptation to the reading task was examined. This was done by ordering the respective ranked GSR and MAP scores for each subject according to the sequence in which the tasks were given.

Since the original order of task presentation was randomized by subjects, the ordering of tasks according to the sequence of task administration resulted in an order which varied from subject to subject. The Kendall coefficient of concordance was then applied to determine if there was agreement among subjects in ranked GSR scores according to sequence of tasks under pre-test and post-test conditions, respectively. The same approach was used to check the agreement among subjects in ranked MAP scores.

By reference to Table 28 it may be seen that in three of the

TABLE 28

CORRESPONDENCE OF RANKED WITHIN-SUBJECT GSR AND MAP SCORES AMONG INDIVIDUALS ORDERED ACCORDING TO SEQUENCE OF TASK

Psychophysiological Variables	Test	Kendall-W	x^2	k
MAP	Pre-Test	.044	5.060	23
MAP	Post-Test	.007	.945	27
GSR	Pre-Test	.039	6.045	31
GSR	Post-Test	.243	36.450***	30

*** $p < .001$

x^2 = Test of significance of Kendall-W

k = Number of sets of ranks

N = 6; number of entities ranked

df = 5

four analyses there was no agreement among subjects when the psychophysiological scores were ordered according to sequence of tasks. Only in the case of the GSR response under post-test conditions was the Kendall-W significant, indicating that the agreement was sufficiently close that it could not be attributed to chance. Examination of the general pattern of ranked scores was, in this case, suggestive of an adaptation phenomenon, but the picture was far from clear. The sum of the scores across subjects for the task given first was the highest and that for the last was the lowest. In the categories between there was no consistent trend. On the basis of the above, there is very little evidence of adaptive responses in our subjects.

Tension Under Reading and Subsequent Recall Conditions

It will be recalled that comprehension was checked immediately following each reading trial by a short multiple choice test. An investigation of tension states in reading, particularly under reading test conditions, would be incomplete without parallel observations under subsequent recall conditions. It was hypothesized that there would be no real within-subject differences in tension (as measured by the magnitude of the GSR) between reading and subsequent recall conditions. The sign test was used to test the hypothesis that reading tests yield a higher within-subject GSR response no more frequently than subsequent answer tasks. Since the number of trials per reading task varied from subject to subject, the analysis included observations on only trial one in each task and its subsequent answer task.

The results of the sign test are given in Table 29. The null hypothesis is supported for reading tasks A and B, but rejected for

TABLE 29

PROBABILITY OF READING TASKS YIELDING A HIGHER GSR RESPONSE MORE FREQUENTLY THAN SUBSEQUENT ANSWER TASKS

Selection	Z	P
A	1.643	.1010
B	1.155	.1230
C	2.600	.0094
D	3.852	.00014
E	2.079	.0376
F	3.104	.0020

The null hypothesis is supported for tasks A and B, but rejected for selections C, D, E and F. Inspection of the data shows that the direction of the difference for selections C, D, E and F is the greater for GSR responses under the answer condition.

tasks C, D, E and F. In other words, higher GSR responses occurred more frequently under answer than under reading conditions in the tasks C, D, E and F, the difference in frequency in these instances being well beyond the .05 level of significance. It is perhaps worthy of note that selection A was the most difficult reading selection for most subjects, which suggests that our findings are perhaps a function of the relative difficulty of the reading task.

Reading Task Failure and Tension in Subsequent Reading Test Trials

The effect of failure in a reading task on tension states in subsequent reading tasks has not been adequately explored. The current investigation provided data which bears directly on this problem. It will be recalled that the testing situation required that repeated trials (up to five) be given on each task, thus making it possible to examine the effect of trial failure on the relative magnitude of the GSR and MAP responses in subsequent trials. Since on most reading tasks only a limited number of subjects needed more than one trial to reach full comprehension, the analysis was restricted to those selections on which 14 or more subjects took more than one trial, namely tasks A and C. The number requiring third, fourth and fifth trials was too few to warrant an analysis of the data beyond the second trial.

The hypothesis to be tested was that the within-subject GSR response (and similarly the MAP response) would be higher no more frequently in trial 2 than in trial 1. The results of the sign test applied to the data in those tasks in which there were 14 or more second trials are given in Table 30. It will be noted that in all instances the probability of a

TABLE 30

PROBABILITY OF TRIAL 2 YIELDING A HIGHER GSR OR MAP RESPONSE MORE FREQUENTLY THAN TRIAL 1

Selection	Test	Psychophysiological Measure	N	X	P
A	Pre-Test	GSR	18	11	.881
A	Post-Test	GSR	18	7	.240
A	Pre-Test	MAP	18	12	.952
A	Post-Test	MAP	20	7	.132
C	Pre-Test	GSR	14	6	.395
C	Pre-Test	MAP	16	9	.773

None of the above sign tests yields significant differences. Hence, the number of instances in which the second trial is higher than the first is well within the limits of chance.

difference occurring is well within the limits of chance. Hence, it can be concluded that under the conditions of this experiment, subjects are not likely to have an increase in GSR or MAP responses in a reading task repeated because of failure to read to full comprehension in the initial trial.

Conclusions

Within the limitations of the investigation the following conclusions would seem to be warranted:

1. The relationship between measures of tension (GSR and MAP) and the difficulty of the reading task (measured by reading time) varies widely among subjects, but for the most part the correlations are low. However, within-subject differences in tension are evident in reading tasks dichotomized on the basis of difficulty for the subject, the most difficult tasks eliciting greater evidence of tension than the easiest tasks.

2. A significantly greater proportion of children show lower levels of tension in reading tasks than in subsequent recall tasks.

3. Repetition of a reading task because of failure on the initial task does not, on the average, result in an increase in tension level.

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CHAPTER VII

A SURVEY OF VARIABILITY IN READING SPEED IN GRADES 4, 5 and 6

The survey of variability in speed of reading in grades 4, 5 and 6 was conducted in May, 1964. The revised version of the initial experimental test was used, which also served for the pre-testing of pupils in the 4th grade experimental training program. This chapter presents the major questions to which answers were sought, the experimental methodology, and the results of the survey.

Major Questions

1. Do children in grades 4, 5 and 6 have a relatively invariant, generalized speed set in reading regardless of their purpose for reading?
    a. Is speed of comprehension for defined purposes affected by grade level?
    b. Is speed of comprehension for defined purposes affected by passage style?
    c. Are there sex differences in speed of comprehension for defined purposes?
2. Are the answers to the above questions the same for within-individual indices of time-purpose variability as for raw time scores or reading rate scores in words per minute?

Methodology

Population Representativeness, Sample Composition, and Sample Size

An important consideration in making a survey of variability in reading speed in grades 4, 5 and 6 in the city of Madison was to secure an adequate and representative sample of the city school population in these grades. Population characteristics which appeared relevant and for which data were available included the median educational and income level of adults 25 years and over by city tracts derived from 1960 United States Census data; the general scholastic ability and reading achievement of pupils by schools made available by the Madison public schools; and the geographical distribution of schools roughly into two groups: (1) those to the west of the geographical center of the city and (2) those to the northeast and southeast of that center.[1] Since schools could be located reasonably well with respect to the major tracts contributing to the school population, an attempt was made to use a combination of adult, pupil and geographical characteristics in defining the population of the study.

The principal steps taken in this process were these:

1. The median income levels and educational levels of adults by tracts were rank ordered and from these orderings an average income-educational rank ordering was derived.

2. All Madison public elementary schools were rank ordered on the basis of the median total scholastic ability of its 5th grade pupils as shown by the results of the California Test of Mental Maturity given in

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[1] The geographical center referred to here is the central portion of the city adjoining the capitol which is located on an isthmus between two lakes.

the fall of 1962. The median I.Q. of the 35 schools was 115. The median scholastic ability level of this class was accepted as representative of the general level of ability of 4th and 6th grade pupils in the same schools.

3. The rank orderings for the adult income-educational levels and the pupil scholastic ability levels were then consolidated into a combined rank ordering. Within this ordering, it was found that several clusters of tracts appeared very similar in the educational and income level of its adults; and likewise, that several clusters of schools served by one or more tracts appeared to be very similar in the scholastic ability of its school population. Thus some eight major clusters, half above and half below the median of the combined rank ordering, were found to represent a grouping together of two or more schools per cluster, each school of which might be considered representative of that cluster.

4. A pool of schools above and below the median of the combined rank ordering was identified, the two pools being distributed among the cluster-steps above and below the median.

5. Schools in each of the above- and below-median rank orderings were identified geographically as belonging to either the western geographical sector of the city, or to the northeast-southeast sector.

6. Schools having pupils in grades 4, 5 and 6 were invited to volunteer for the survey. Eighteen schools responded to the request.

From the 18 responding schools, 10 were identified independently by a stratified random sampling method to provide an adequate pool of subjects. If a school identified by this procedure had volunteered for the survey, it was used; if a school so identified had not volunteered, a school of similar rank was substituted. The 10 schools equally represented the two major geographical sectors of the city (five schools per sector) and likewise equally represented the upper and lower values of the combined rank ordering of adult income-educational and pupil scholastic ability level (five schools above and five below the median ranking). Within the latter stratification it was decided that only subjects whose reading comprehension was at or above grade level on national norms upon standardized tests given the preceding fall by the schools would be used. These data were secured from the appropriate scores on the STEP for grade 4, the Iowa Tests of Basic Skills for grade 5, and the California Achievement Test for grade 6. An equal number of boys and girls were included at each grade level in the survey.

Since a fundamental consideration of the survey was to secure a sufficiently representative sample for analytic purposes rather than necessarily to meet the assumption of a proportional descriptive survey of population enrollments by grade, school and sector, it was decided that a randomized sample with these characteristics would suffice: 100 subjects randomly drawn from each of grades 4, 5 and 6, representing a different classroom in each of 10 schools (30 classrooms in all), with five boys and five girls to be drawn from each classroom. The total sample of the survey was thus 300 pupils. This represented approximately 4.5 per cent of the total city school population of 6,658 pupils in those grades.[1]

For the identification of the sample population of pupils by schools, grades and classes, complete class lists and relevant test data for the 10 selected schools were provided by the central office of the Madison public schools. Randomization of the sample by grades within schools was effected by listing in serial order all students in a given grade by schools, then randomly drawing the necessary number of boys and girls per classroom for each school. If a selected student did not meet the criterion of the 50th percentile or better in reading achievement, his name was dropped and the randomizing procedure continued. To insure an adequate supply of pupils per classroom in case of absence or transferral, six additional subjects, three boys and three girls, were identified from each class at the time of randomization and were used as substitute choices if necessary. These procedures were continued until the required number of pupils was drawn by sex, classroom, grade, and school.[1]

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[1] Population by grade levels was: 4th, 2,359; 5th, 2,208; and 6th, 2,091.

Test Administration

The trained examiners who administered the survey tests in the schools had one month's prior experience in administering tests and daily training exercises in the experimental training program. Thus the survey test was administered to two children at a time after an explanation of the three purposes for which they were to read. Stopwatches were used by the examiners to clock reading time per trial to the nearest second. Selections were individually timed and scored for a maximum of five trials, the criterion level being 100 per cent comprehension of the assigned purpose for reading.

Method of Analysis

Analysis of variance was employed to study the degree of variability in the reading time of pupils by grade levels with respect to three reading purposes, two styles of writing, and sex. Three separate analyses were run for the three types of scores discussed previously: purpose variability indices (PVIs), total reading time (in seconds), and reading rate in words per minute.

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[1] The mean I.Q.'s available for 293 of the survey population, based upon the California Test of Mental Maturity given in grade 3, were: boys, 120; girls, 116; combined, 120.

Results

Within-Individual Purpose Variability Indices Results

The summary of the analysis of variance for the three within-individual PVIs--Sequence/Specific Fact, Main Idea/Specific Fact, and Sequence/Main Idea--is given in Table 31.

No significant differences were revealed for sex, the indices being 1.670 for boys and 1.728 for girls. No significant differences were likewise found for grade level. The mean grade level individual PVIs irrespective of style and sex were remarkable similar: 4th grade, 1.667; 5th grade, 1.653; and 6th grade, 1.778. This finding would appear to mean that taking into account the three purposes for reading per individual, the average variability or spread in individual reading time relative to purpose was not significantly affected by grade level. Had mean reading times for each purpose been highly similar, the indices would have approached 1.0. Since the mean indices are larger than 1.5, it also may be inferred that certain differences in reading time according to purpose would likewise be reflected in the mean PVIs for each of the three sets of purposes compared per individual.

Significant differences at the .01 level were indeed found across the three grade levels among the indices of 1.777 for S/SF, 2.090 for

TABLE 31

SUMMARY OF ANALYSIS OF VARIANCE OF PURPOSE VARIABILITY INDICES FOR 100 PUPILS IN EACH OF GRADES 4, 5, and 6 WITH RESPECT TO THREE READING PURPOSES, TWO STYLES OF WRITING, AND SEX

Source of Variance	Sum of Squares	df	Mean Squares	F
Grade	5.604	2	2.8017	1.354
Sex	1.492	1	1.4918	<1
S_x x G	10.989	2	5.4942	2.656
S_s/S_x and G	608.171	294	2.0686	
Purpose	226.651	2	113.3255	80.830**
Style	178.504	1	178.5042	127.320**
S_t x PVI	389.952	2	194.9761	139.069**
S_x x S_t	.063	1	.0631	<1
S_x x PVI	.756	2	.3780	<1
G x S_t	2.034	2	1.0168	<1
G x PVI	5.312	4	1.3278	<1
S_x x G x S_t	5.928	2	2.9642	2.114
S_x x G x PVI	16.356	4	4.0890	2.916
G x S_t x PVI	1.822	4	.4556	<1
S_x x S_t x PVI	.007	2	.0034	<1
S_x x G x S_t x PVI	4.509	4	1.1271	<1
Ss/S_x and G/S_t and PVI	2061.791	1470	1.4025	
Total	5197.513	1799		

** $p < .01$

Note: The error term for the row sources of variance is the subjects/sex and grade mean square. Degrees of freedom are used according to standard procedure. The error term for the column and the R x C sources of variance is the subjects/sex and grade/style and purpose mean square. Due to the lack of equal covariances among the sources of variance, all F values for columns and R x C are entered in the F distribution with 1 and 1470 df. This, then, is a more conservative test for assessing the significance of the F's. (Greenhouse and Geisser, Psychometrika, 1959)

MI/SF and 1.273 for S/MI. The Scheffé test showed that the following comparisons between indices were significant (.05): MI/SF versus S/MI; MI/SF versus S/SF and S/MI; and S/MI versus S/SF and MI/SF. (S/SF versus S/MI was the only comparison of indices significant in the 4th grade experimental training program.) Thus the low index for S/MI shows that the average reading speed for Main Idea was only slightly greater than that for Sequence, while the relatively high indices for MI/SF and S/SF show that average reading speed for Specific Fact was considerably greater than for either Sequence or Main Idea.

A significant difference at the .01 level was also found for style, the mean individual variability index for narrative style of 2.014 being much larger than the index of 1.384 for expository style. This finding shows that, on the average, subjects in grades 4, 5 and 6 were more variable in their adjustments of individual reading speeds to reading purposes for narrative than for expository materials. The interaction of style x purpose was likewise significant at the .01 level. The interaction effect was apparently caused by the sharp reversal revealed in the S/MI index which indicated that narrative materials were on the average read for the Main Idea more slowly in relation to Sequence than were expository materials. The very low index of .955 for narrative S/MI shows that a substantial number of subjects must have read narrative materials for the Main Idea relatively more slowly than for the Sequence of Ideas. The entire pattern of individual variability indices (S/SF 2.137, MI/SF 2.951, S/MI .955) for narrative materials is much more erratic than the relatively stable pattern of indices for expository materials (S/SF 1.417, MI/SF 1.229, S/MI 1.508).

Total Reading Time (in Seconds) Results

The results of the analysis of variance upon reading time scores to full comprehension of the purpose for reading are shown in Table 32 A significant main effect at the .01 level was found for grade level, which indicates that substantial differences in average total reading time existed across grades. The mean reading time scores of 38.9 seconds for 4th grade, 36.1 seconds for 5th grade and 32.3 seconds for 6th grade indeed show a progressive decline in the average amount of time needed per grade to achieve comprehension irrespective of purpose for reading. The Scheffé test indicated differences significant at the .05 level between grades 4 and 6, between grades 4 versus 5 and 6, and between grades 6 versus 4 and 5. No significant differences were found, however, between adjacent grades.

No significant main effects were found for sex, boys reading the test passages in a mean time of 36.4 seconds and girls in 35.1 seconds. A similar non-significant finding was obtained for differences in passage style, the mean time for narrative passages being 35.0 seconds and that for expository passages, 36.5 seconds.

However, highly significant differences at the .001 level were found for time taken to accomplish the reading purpose to full comprehension. The mean reading time for each purpose was: Main Idea, 42.2 seconds; Sequence, 37.7 seconds; and Specific Fact, 27.4 seconds. Thus the fastest mean passage reading time irrespective of grade level, sex and style occurred in Reading to Find a Specific Fact and the slowest in Reading to Find the Main Idea. The Scheffé test revealed differences significant at the .05 level among all combinations of purposes except for MI versus S and S versus MI and SF.

TABLE 32

SUMMARY OF ANALYSIS OF VARIANCE FOR READING TIME (IN SECONDS) FOR 100 PUPILS IN EACH OF GRADES 4, 5 AND 6 WITH RESPECT TO THREE READING PURPOSES, TWO STYLES OF WRITING, AND SEX

Source of Variance	Sum of Squares	df	Mean Squares	F
Grade	13096.763	2	6548.3816	5.7026**
Sex	655.220	1	655.2199	<1
S_x x G	34.763	294	17.3816	<1
Ss/S_x and G	37601.753		1148.3052	
Purpose	69376.053	2	34688.0266	87.4768***
Style	1012.500	1	1012.5000	2.5533
S_t x P	72859.480	2	36429.7400	91.8691***
S_x x S_t	2417.442	1	2417.4422	6.0963*
S_x x P	671.453	2	335.7267	<1
G x S_t	373.390	2	186.6950	<1
G x P	1332.173	4	330.5433	<1
S_x x G x S_t	1084.168	2	542.0838	1.3670
S_x x G x P	9459.713	4	2364.9288	5.9639*
S_x x S_t x P	24.338	2	12.1688	<1
G x S_t x P	2353.540	4	588.3849	1.4837
S_x x G x S_t x P	549.902	4	284.0571	<1
Ss/S_x and G/S_t x P	582912.847	1470	396.5393	

* $p < .05$
** $p < .01$
*** $p < .001$

In addition, a highly significant interaction at the .001 level was found between style of materials and purpose for reading. The variance causing the interaction to be significant is largely due to the fact that the average reading time for Main Idea-narrative (49.8 seconds) was much slower than for Main Idea-expository (34.7 seconds), while the average reading times for both Specific Fact-narrative (19.5) and Sequence-narrative (35.8) were relatively faster than for these same purposes in relation to expository materials. It is of interest that the average reading time for expository style was quite similar and corresponded closely to the average time for Sequence-narrative.

A further second order interaction significant at the .05 level was found between passage style and sex. Girls as a group read narrative passages considerably faster on the average than expository passages, while the boys tended to read expository passages slightly faster than narrative ones. Sex likewise appears as one of the variables in the third order interaction in which sex x grade x purpose was found to be significant at the .05 level. The interaction indicates that the reading time performance of boys and girls across grade levels was not consistently in the same direction according to their purpose for reading.

Words Per Minute Reading Rate Results

Table 33 shows that the effect of grade level was significant at the .05 level, the mean scores being, respectively, 153 words per minute in 4th grade, 160 per minute in 5th grade, and 178 words per minute in 6th grade. Two other results were significant at the .01 level, reading purpose and the interaction style x purpose. The mean scores according to purpose were: Main Idea, 142 words per minute; Specific Fact, 207

TABLE 33

SUMMARY OF ANALYSIS OF VARIANCE OF WORDS PER MINUTE SCORES FOR 100 PUPILS IN EACH OF GRADES 4, 5, AND 6 WITH RESPECT TO THREE READING PURPOSES, TWO STYLES OF WRITING, AND SEX

Source of Variance	Sum of Squares	df	Mean Squares	F
Grade	200793.624	2	100396.8120	4.5514*
Sex	11673.920	1	11673.9199	.5293
S_x x G	2861.109	2	1430.5546	<1
Ss/S_x and G	6485157.394	294	22058.3584	
Purpose	1709208.490	2	854604.2451	13.8544**
Style	178921.620	1	178921.6201	2.9006
S_t x P	1868433.924	2	934216.9619	15.1451**
S_x x S_t	34008.320	1	34008.3203	5.5133*
S_x x P	40551.124	2	20275.5620	3.2870
G x S_t	31144.569	2	15572.2846	2.5245
G x P	76901.706	4	19225.4265	3.1167
S_x x G x S_t	11670.244	2	5835.1220	<1
S_x x G x P	55737.007	4	13934.2517	2.2589
G x S_t x P	42453.807	4	10613.4516	1.7206
S_x x S_t x P	602.889	2	301.4443	<1
S_x x G x S_t x P	21621.427	4	5405.3566	<1
Ss/S_x and G/S_t and P	9067629.207	1470	6168.4552	
Total	48100393.619	1799		

* $p < .05$
** $p < .01$

words per minute; and Sequence, 141 words per minute. These findings, and those of the significant interaction, are in a sense a reciprocal of the time in seconds scores. As in the preceding analysis, no significant differences were revealed for sex or passage style. However, the significant interaction of sex x grade x purpose found in the analysis of raw time scores was not confirmed by the words per minute analysis.

It would appear then, that one effect of the use of a derived score such as words per minute in the estimation of reading speed is to vitiate the level of significance of the variables under study. It would also appear not to reveal the triple interaction reported of significance by a raw score analysis. With these qualifications in mind, and with respect to the effect of grade level, the role of purpose and the interaction of purpose and passage style, the use of reading rate scores (words per minute) generally confirms the findings of an analysis of reading time in seconds.

Discussion

It is apparent from these comparative analyses that acceptance of the principle that a score in which within-individual variability of reading time relative to reading purpose best describes the basic purposes of this investigation will significantly affect one's interpretation of the results presented. This is illustrated most dramatically by the finding that individual variability indices of the relative adjustment or spread of reading time for three reading purposes is not significantly different from one intermediate grade level to another, whereas reading time in seconds or reading rate in words per minute does change significantly during this period. In other words, children on the average become more efficient in the later grade levels but not more variable in their adjustment of reading speed to reading purpose. Similarly, passage style was shown to have a significant effect relative to individual variability in reading speed according to purpose but not according to analyses of absolute reading speeds. . .

Thus type of score, relative variability or absolute speed, does affect the answers to the questions posed earlier. There is consistent evidence from each of the analyses that the brief introduction to and clarification of three purposes for reading enabled these children in grades 4, 5 and 6 to display a significant adjustment of their reading speed to three defined purposes to a criterion of full comprehension of the specified purpose. They did so in a different manner according to passage style, narrative or expository, according to each type of analysis. Therefore there is evidence from a sample of intermediate grade children who possess good basic reading skills that their speed set in reading is not invariant regardless of reading purpose at least for the particular reading tasks and materials employed in this study. No evidence, however, was found by within-individual analysis that children from one intermediate grade level to another possessed, on the average, significantly different variance in their reading speed sets. This finding suggests a specific and realistic task for the schools--to develop not only increased reading speed, but reading speeds which are adjusted more efficiently to different purposes and materials at successive grade levels.

CHAPTER VIII

SUMMARY AND CONCLUSIONS

Resumé

The Problem

This study stems from the observation that whereas there is general agreement among those in the teaching profession concerned with the teaching of reading that the effective reader adjusts his reading speed to his purpose for reading, there is little evidence that this objective is accomplished to a satisfactory degree at any educational level. The Committee for Research in Basic Skills, which has conducted an extensive series of investigations into the quality, speed and tension dimensions of handwriting particularly in children of elementary school age, therefore decided to examine experimentally the general hypothesis that children in the intermediate grades have a relatively invariant, generalized speed set in reading. The Committee further proposed to conduct a short training program to teach 4th grade children to vary their reading speed according to three specified purposes--Reading for the Main Idea, Reading to Find a Specific Fact, and Reading for the Sequence of Ideas. The training program was designed to test the additional hypotheses that 4th grade children could learn to vary efficiently their reading speeds for different specified purposes, would display less tension in reading as a result of such training, and would evidence change in their perceptions of the reading task by learning to predict their speed of reading for different purposes progressively more realistically (accurately). The more specific experimental hypotheses related to these general hypotheses are elaborated in the chapters devoted to each of these aspects of the study.

Phases of the Study

Several distinct phases of the study may be noted. One phase involved the construction of an initial experimental test and its administration to 256 4th grade pupils to study the influence of several pertinent variables upon reading speed as reported in Chapter II. A second phase had to do with making the necessary curriculum decisions involved in the planning and preparation of a 2-week training program and the necessary testing and training materials for adjusting reading speed to each of three specified reading purposes under five types of experimental training conditions (Chapter III), the experimental methodology and results of which are described in Chapter IV. It should be noted that with the possible exception of the Self-Selection group, which was free to choose the daily purpose for work, each group received some practice each day upon each of the three reading purposes. Concurrently with this phase of the study, data were gathered concerning the children's perceptions of the reading task and materials (Chapter V) and concerning degree of tension exhibited by the galvanic skin response (GSR) and muscle action potential (MAP) of a selected muscle group (Chapter VI). The final phase of the study involved the administration of the training pre-test of variability in reading speed according to purpose to a randomly drawn, representative sample of 300 urban pupils, one-third of whom were in each of grades 4, 5 and 6 (Chapter VII).

Major Findings

This study has demonstrated that for children of good or better than average reading ability in the 4th grade to whom is administered a 2-week training program of 40 minutes per day, a very substantial variability among reading speeds for specific purposes is obtained. In a training program in which such children are given (a) a brief introduction to three types of reading purposes, (b) short testing and training passages carefully constructed as to unity, coherence, emphasis, and appropriate content and difficulty level, (c) separate selections for narrative and expository styles and (d) testing to a criterion of full comprehension for each specified purpose, these children were shown to:

1. Possess a hitherto unreported ability to significantly adjust their reading speeds very quickly to their purposes for reading;

2. Significantly alter the pattern of reading speed relative to reading purposes and maintain a significant spread in speed-purpose variability while at the same time increasing their reading speeds for each purpose approximately 40 per cent, with further gains upon retention tests three weeks after training;

3. Adjust their reading speeds to reading purposes significantly differently according to passage style and to a certain extent according to sex;

4. Display the greatest improvement in adapting to the faster reading purposes, Main Idea and Specific Fact; and

5. Respond favorably to several types of training emphases.

The results of the project also showed that:

6. Children of comparable reading ability in the 5th and 6th grades

have no more variability or spread in their reading speeds according to reading purposes than do children in the 4th grade;

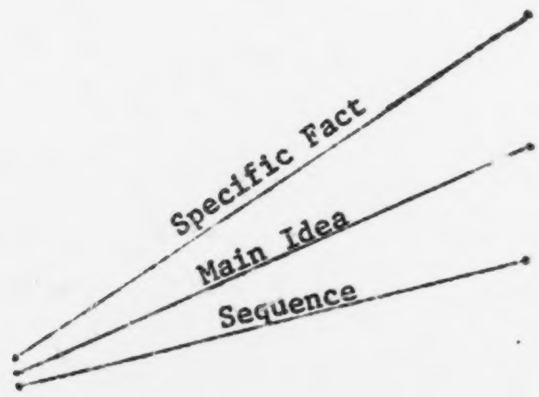
7. Children, by their own daily ratings, greatly enjoyed the 2-week training period which was largely self-instructional in nature;

8. Children became significantly more realistic (accurate) during this short training period in predicting their reading speeds for the reading purpose with which they were most familiar, Sequence of Ideas, but not for Main Idea or Specific Fact; and

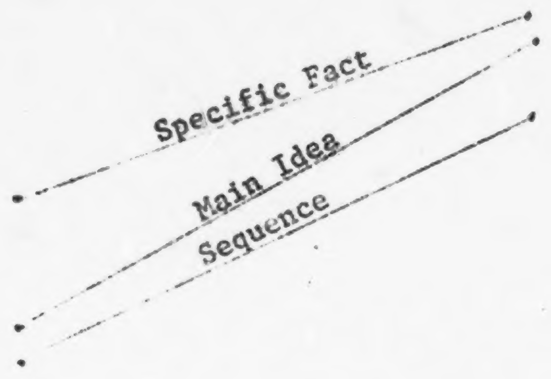
9. No untoward evidences of tension were found to be associated with reading the test passages or answering questions on them.

Conclusions and Implications

The major hypothesis that children at the intermediate grade levels possess a relatively invariant speed set and thus do not appreciably alter their reading speed for each of three specified purposes was not confirmed by this study. This finding is at variance with that of other reported research, with the impression of many educators and laymen, and indeed with the starting assumption of the investigators. The model of expected initial and final performance projected by the investigators in terms of change in reading rate may be visualized thus:



Thus it was anticipated that there would be a non-significant initial spread in reading speed and a significantly greater spread at the end of training. However, unadjusted mean reading rate scores revealed the following general picture:



The rapid increases in rate resulted in an actual compression in the spread of reading times relative to the initial spread although it should be stressed that when the initial spread was adjusted through analysis of covariance, the final spread produced by training was significant. Reading speeds for Main Idea and Specific Fact purposes moved closer together and away from that for Sequence, thus confirming the greater susceptibility to training of the potentially more rapid reading purposes.

Such a finding leads to the conclusion that children who possess good basic reading skills in the intermediate grades are capable of hitherto unsuspected abilities of adjusting their reading speed to reading purposes upon demand and can improve their efficiency in this reading task tremendously in a very short training period while still differentiating their adaptation of reading speed to reading purposes. The fact that no prior evidence of this adaptability has been reported suggested that the findings of this study may be in part due to the particular task presented: the relatively short passages of substantially the same level of difficulty, the specificity of purposes, the structuring of the materials, the specificity of the response task, and the criterion of full comprehension of the specific reading purpose. Nevertheless, since great care was taken to achieve a reasonable degree of control over such variables as these in the experimental tests and training materials, it would appear that some confidence might be placed in many of the findings because of the very presence of these controls so frequently absent in assessments of reading speed.

It would appear that two decisions made in the course of the study, to require comprehension of the purpose for reading and to analyze the data as time-purpose ratios as well as raw time scores and converted words per minute scores, are especially relevant for research into the reading speed-purpose relationship and for their implications for educational practice. Had not the attainment of comprehension of the reading purpose been achieved, the reading speed score would have been meaningless in this investigation. Thus control of both the reading purpose and its comprehension through reading is essential in research into the speed component of reading, lest, as often happens in reading practice, credit for irrelevant aspects of comprehension contaminates the speed score. The question at issue here is essentially the same one involved in such a practice as adjusting a reading rate score downward by 20 per cent if, for example, a person obtains a reading comprehension score of only 80 per cent (8 out of 10 questions right) on a test of reading rate. Such a scoring adjustment begs the question of the comparative significance of the questions and would, for example, credit a person who misses a question related to the main idea of the passage and one pertaining to a significant detail with the same speed (of reading comprehension?) as one who correctly answered those questions yet missed two others on less relevant details. Furthermore, in keeping with other observations on the real utility of using a words per minute score to describe reading speed, it was evident in this investigation that many pupils learned to use highly selective techniques of scanning material in the Main Idea and Specific Fact tasks, so much so that to describe this type of performance by the same unit--number of words read--as that used to describe their performance in Reading for the Sequence of Ideas is highly misleading. Clearly, in the more rapid reading of these children, the basic unit to which they were responding was larger than the word. For this reason, the use of raw time scores, and for the specific purpose of this investigation, a ratio of time of one purpose to another, appears preferable. The utility of the ratio in describing reading speed relative to two or more reading purposes was brought out particularly in the finding of the survey that there were no significant differences in the ratios of reading speed to reading purpose across grades 4, 5 and 6 while scores of reading speed alone did show significant difference across these grades. Since the ratio score thus describes the relation of speed for one purpose to another irrespective of changes in absolute speed, it is recommended as a valuable scoring technique especially for research into the speed-purpose relationship. Recognition by the educational community of the need for an appropriate score to describe reading speed adequately would do much to correct current misconceptions of the nature and development of efficient reading speeds.

The findings of the study with respect to the nature of the materials used also suggest several implications for educational practice and further research. The persistent effect of narrative versus expository style upon adjustment of reading speed to reading purpose throughout the study is especially noteworthy. It may be argued for example, that since the author's purpose in writing fiction is fundamentally quite different from that in writing prose, the respective styles might differ in ways that would significantly affect the reader's speed in relation to his reading purposes. It was found in this study that expository writing was read in general more rapidly irrespective of the purpose for reading than was narrative writing, a finding that may conceivably be related to the more logical and orderly progression of ideas in the former. It was also found that narrative material generally produced greater speed-purpose variability than did expository materials, a finding which may be related to such factors as the more variable writing patterns and the greater latitude in density and the ordering of ideas enjoyed in the writing of fiction. It would thus appear that in educational practice the choice of style of writing may directly affect the reader's speed in the attainment of comprehension of a specific purpose and might accordingly be expected to alter the expectations of teachers and the practices of test-makers who attempt to assess the speed-purpose variable.

Since an attempt was made in this study to build testing and training materials that represented reasonably good "models" of paragraph structure as one way of seeking to control the reading task, it cannot be necessarily inferred that children's performance upon less structured materials will be likewise the same. Such a correspondence can only be demonstrated by an extension of this study to examine the transfer effects of such training upon the reading of less-structured and perhaps longer materials more typical of the daily classroom reading diet. However, since children made such dramatic progress upon these clearly-structured and, the investigators hope, well-written materials, the implication is strong that well-written materials in the elementary curriculum are essential for effective progress in adjusting reading speed to reading purposes.

This study also has perhaps some further implications with respect to the role of familiarity and difficulty of materials in reading. At the 4th grade level it would appear that pupils' judgments of familiarity of a selection, as discussed in Chapter V, may have one of several bases other than mere topical or content familiarity, which may merit further investigation. Thus study likewise reinforces in a rather unique way the commonly-made observation that reading difficulty is indeed a difficult factor to control. Although strict controls were placed upon vocabulary, sentence length and sentence complexity, for example, upon the six pre-test selections, one narrative paragraph to be read for the Main Idea required far more trials for comprehension of this purpose than did the remaining five selections, including an expository paragraph to be read for the same purpose. The two paragraphs to be read for the Main Idea--the first apparently "difficult" and the second apparently "easy"--are reproduced here to invite the speculation of the reader as the reason for the apparent discrepancy.

> Sheba came down from her mountain home seeking food. She had traveled far and was tired and hungry. She was not very old but she was crippled. Long ago she had jerked one hind paw free from a trap. The paw healed, but she could never again jump so quickly or so far. Crippled Sheba could no longer catch and kill wild animals for her food.

> There is not enough food or water in the desert for most animals. When the camel drinks, he stores extra water in his stomach. He uses this water later when it is needed. The fat in his hump is used as extra food. The camel seldom needs to stop for food and drink. The camel travels farther without needing food and water than other desert animals.

The complete pre-test may be found in Appendix G.

Sex was found to be a rather consistent variable in this study though not always a predictable one in its interaction with types of training and reading purpose. The generally greater average reading speed found for boys in response to training and the corresponding greater average speed-purpose variability generally found for girls suggests that boys as a group may have responded especially well to the specificity of the task and the challenge of the speed component in the task. On the other hand, whether the sex differences would prove to be a long-term effect is debatable, since the PVI for sex was non-significant upon the post-retention covariance analysis, though at the same time a significant sex x type of training interaction was significant for this type of score.

Valuable insight was further gained in this study into the effects of different training emphases particularly in terms of the pupils' perception and enjoyment of the reading tasks. It seems clear that emphasis in training upon those reading purposes conducive to more rapid reading, Reading for the Main Idea and Reading to Find a Specific Fact, were more favorably received by pupils than was an emphasis upon a less rapid type of reading with which they were more familiar, Reading for the Sequence of Ideas. Perhaps even more significant was the very favorable acceptance of self-selection by these pupils. The Self-Selection group, being allowed to choose the purpose which they thought important to work upon, apparently exercised this right of choice with sufficient wisdom as to make their efforts equally as rewarding or more rewarding than other training groups. The investigators would have no hesitancy in recommending that a training program in adjusting reading speed to reading purposes not only be self-instructional but that pupils be allowed to choose the purposes upon which they feel they need the most work to achieve such a goal.

It is clearly evident from this study that the relatively short-term training of intermediate grade children to vary their reading speed according to different purposes for reading under appropriate conditions of self-instruction is a feasible, enjoyable and effective way to improve their efficiency in reading. Consistent evidence was also presented that excellent retention if not further growth effects was present 3 weeks after the cessation of training. The nature and level of the reading materials and of the task itself was one for which these children, albeit "good" readers, were clearly ready. The experimental subjects displayed encouraging insight into their own progress in adjusting reading speed to reading purposes. They improved in their ability to predict their reading speed more realistically in the slow reading task with which they were most familiar and probably would have improved in predicting the faster speed tasks of Main Idea and Specific Fact with added practice. There was no evidence that the reading tasks produced unfavorable tension effects; on the contrary, the tasks appeared to be challenging enough yet ones on which these children could succeed so that an optimal level of tension was indeed achieved. In this sense, and in the sense that clearly defined goals were set toward which the children could work with continuous feedback on their performance as they recorded their daily expectancy and attainment levels, it may be concluded that a situation favorable for learning existed in this study and that similar favorable conditions could be readily established in schools. It is most important that this be done and done early if schools are to produce selective and efficient readers to which the program of reading instruction in American schools is dedicated.

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APPENDIX A

EXAMINER'S DIRECTIONS
PRE-TEST TRAINING--MAIN IDEA

TEST SITUATION

Two examiners will work together and test four children at one time. If possible, the two children working with each examiner should be seated opposite the examiner at a table. Only the materials needed for testing the particular children should be on the table.

TEST EQUIPMENT

Stop watch for each child. (Check method of operation. Wind watch daily.)

Sample booklets	Inventory sheets
Test training booklets	Story folders
Test booklets	Pencils
Answer sheets	Paper clips

PROCEDURE: Introduction

(Introduce selves to pupils.) SAY: My name is___________. This is __________. Now tell us your names again. (Verify that you have the correct test folders for each child.)

SAY: We want you to help us find out more about how we read. We will ask you to read something silently for us in just a few minutes.

This is not a school test. What you do will not be reported to your teachers. But we hope you will all do your best to help us.

PROCEDURE: Clarifying Main Idea and Order

SAY: First we are going to read something together. Sometimes we'll read to find main ideas. Sometimes we'll need to read and remember the order in which things happen. Now let's be sure that you understand what we mean by main idea and order.

The main idea is the part of the story or paragraph that tells the most about what is in it.

See if you can find the main idea in this story: (Show folder 1--main idea first.)

Appendix A

If you could pick just one sentence to tell what this whole story is about, which sentence would it be? (Pause.) Yes. (If wrong, phrase next as a question: What--.) That is really the big idea in the story. All the other sentences just tell what he did to get ready for his trip.

(Show folder 2--main idea last.) What is the main idea now? (Pause.)

(Show folder 3--main idea in middle.) If it were this way in the story, what would be the main idea? (Pause.)

If the sentences were all mixed up, could you still find the main idea? (Show folder 4--sentence order mixed up. Pause.)

Now let's look at what reading to find the right order means. Reading to find the order in which things happened means paying attention to what happens first in the selection, what next, what after that, and so on. You need to remember where different ideas come in the story, so you can tell the right order. (Show folder 1.) We'll look at the story again. Read it over to remember the right order. (Pause.) If these sentences were all mixed up, could you put them back in the right order? (Show folder 4.) Which sentence is the Main Idea? (Pause.) What did he do first? (Pause.) What did he do second? (Pause.) What did he do third? (Pause.) What did he do fourth? (Pause.) Now we've put the story back in the right order. (Show folders 1 and 4.) Are there any questions? (Pause.)

PROCEDURE: Getting child data

(Hand out test booklet with white data sheet on top.) SAY: Please fill in these spaces about yourself on this sheet.

(Collect test booklets. Verify that information is complete. Hand out yellow direction sheet of sample booklet.)

PROCEDURE: Sample Booklets

SAY: Now let's look at a sample direction sheet. Read with me the directions on the yellow sheet in front of you: "The selection on the next page is about--" What? (Pause for answer. Be sure each is paying attention). Yes, it's about ____________________________ (repeat title).

The next line says, "You are to read this selection once for this purpose--to find the most important or main ideas." Why are you to read the selection? (Pause.) Yes, to find the main ideas.

Next it says, "When you are through reading this selection once, you should raise your hand. Then you will be shown a list of sentences telling about the selection. The sentences will be in a mixed-up order. You will be asked to pick out the most important ideas from this list and mark them with an X."

The next line says, "Be sure you know these words before you start to read." When you get the next booklet, be sure to study the words carefully. Ask about any words you don't know.

At the bottom of the page it tells you, "Remember, you are to read the selection once, to find out the most important or main ideas."

Then it says, "Wait until you are told to start reading."

Are there any questions? (Pause. Exchange white selection for yellow directions.)

SAY: This is a sample selection you don't need to read. Now look at the bottom of the page. It says, "As soon as you finish reading once, raise your hand. Do not re-read. You will be told when to go ahead to the next page." (Exchange blue answer sheet for white selection.)

It says here, "Follow these directions without looking back at the selection. The sentences below tell about what you have just read. The sentences are in a mixed-up order. You are to find the most important or main ideas."

Next it says, "1. Look at the six sentences below. Mark one sentence with an X to show the first main idea." (Point out first six sentences.)

Direction 2. tells you to do exactly the same thing to find the second main idea. (Point out second six sentences.) Are there any questions? (Pause.)

(Collect blue answer sheet.)

PROCEDURE: Test Training

(Take off white data sheet from test training booklet. Place watch on data sheet for each child. Give pupil yellow direction sheet. THE PUPIL SHOULD HAVE ONLY ONE SHEET BEFORE HIM AT ANY GIVEN TIME.)

SAY: Here is a new direction sheet. It may or may not be like the one you have just seen. Read the new directions carefully. Study the new words.

(Pause.) Are there any questions? (Collect yellow direction sheet.)

Here is the selection. (Hand out white selection sheet.) Read all of it. Ready? Begin. (FOLLOW DIRECTIONS FOR USE OF STOPWATCH--attached.)

(Start watch. Stop watch when pupil finishes. Pick up selection. Record time. Reset watch. IF PUPIL HAS STOPPED TO ASK A QUESTION, BE SURE TO RECORD TIME BEFORE RESETTING WATCH. THEN ADD BOTH TIMES TOGETHER FOR TOTAL TIME.)

Appendix A

(Hand out first blue answer sheet.) SAY: Read the directions carefully. Then go right ahead. Ready? Begin.

(Start watch. Stop watch when pupil finishes. Pick up answer sheet. Record time. Reset watch.)

(Mark only correct answers with a big "C." If one pupil makes no errors, give him something to read until other pupil finishes.)

(For pupils making errors, transfer correct answers only to next answer sheet. Show this new answer sheet to the pupil.) SAY:

Here are the answers you got right.
OR
You did not get any answers right.

SAY: We want you to get all the answers right. If you are not sure about what to do, read the directions again right now. (Pause.) Here is the selection to read once more. (Exchange white selection for the blue answer sheet.) Ready? Begin.

(Time and score. Repeat scoring procedure alternating with the reading of the selection until the pupil gets all answers correct or needs five trials.)

PROCEDURE: Test Booklets

(Take off white data sheet from test booklet. Place watch on data sheet for each child. Give pupil yellow direction sheet. THE PUPIL SHOULD HAVE ONLY ONE SHEET BEFORE HIM AT ANY GIVEN TIME.)

SAY: Here is a new direction sheet. It may or may not be like the one you have just seen. Read the new directions carefully. Study the new words.

(Pause.) Are there any questions? (Collect yellow direction sheet.)

Here is the selection. (Hand out white selection sheet.) Read all of it. Ready? Begin. (FOLLOW DIRECTIONS FOR USE OF STOPWATCH--attached.)

(Start watch. Stop watch when pupil finishes. Pick up selection. Record time. Reset watch. IF PUPIL HAS STOPPED TO ASK A QUESTION, BE SURE TO RECORD TIME BEFORE RESETTING WATCH. THEN ADD BOTH TIMES TOGETHER FOR TOTAL TIME.)

(Hand out first blue answer sheet.) SAY: Read the directions carefully. Then go right ahead. Ready? Begin.

(Start watch. Stop watch when pupil finishes. Pick up answer sheet. Record time. Reset watch.)

Appendix A

(Mark only correct answers with a big "C." If one pupil makes no errors, give him something to read until other pupil finishes.)

(For pupils making errors, transfer correct answers only to next answer sheet. Show this new answer sheet to the pupil.) SAY:

Here are the answers you got right.
OR
You did not get any answers right.

SAY: We want you to get all the answers right. If you are not sure about what to do, read the directions again right now. (Pause.) Here is the selection to read once more. (Exchange white selection for the blue answer sheet.) Ready? Begin.

(Time and score. Repeat scoring procedure alternating with the reading of the selection until the pupil gets all answers correct or needs five trials.)

(Immediately after pupil has completed final test, hand out inventory sheets.) SAY: We want to know what you thought about the selection you just read. Put your name on this sheet. Then put an X by one answer for each question. If there are any words you don't know, ask about them. This is not a test.

(When finished, take pupils back to room and get new subjects.)

(IF THE PUPIL DOES NOT SUCCEED IN FIVE TRIALS, HE WILL BE CONSIDERED NOT TRAINABLE AND A "SPARE" PUPIL WILL BE SUBSTITUTED FOR HIM LATER.)

APPENDIX B

EXPERIMENTAL TEST INVENTORY

NAME________________________________

Now mark one answer to each of these questions with an X.

How interesting was the selection?

_____ very interesting

_____ interesting

_____ uninteresting

How fast did you read it?

_____ at my usual speed

_____ slower than usual

_____ faster than usual

How familiar was it?

_____ very familiar

_____ slightly familiar

_____ unfamiliar

How hard to read was it?

_____ easy to read

_____ hard to read

_____ about right; neither hard nor easy

APPENDIX C

OBJECTIVES FOR THE TRAINING PROGRAM

A Statement Proposed by
Leona Schnicke and Roger Bennett
Research Assistants

Flexible readers adjust their reading speed to their assessment of the reading task. The reading task is assessed according to the purpose for reading and the nature of the material to be read. Flexible readers vary their reading speed within a reading task according to their continuous evaluation of performance.

Over-Arching Objective: To improve reading efficiency.

Specific Objective: To help intermediate grade level children develop a flexible speed set toward the reading task, based on their assessment of purposes for reading and materials to be read.

Instructional Objectives:

I. Concepts are the knowledges and understandings the children need to acquire--the "what" or content of the training program. Concepts to developed may be considered relative to:

  A. The Individual Reader. An individual can:

    1. Read at different speeds.
    2. Become aware of his own reading performance.
    3. Assess reading materials.
    4. Establish and select purposes for reading.
    5. Organize his own plan for reading.
    6. Evaluate his reading plan and performance.

  B. The Reading Materials. Materials have different:

    1. Styles (narrative, expository, or combinations of these).
    2. Structures (inductive, deductive, or combinations of these).
    3. Levels of complexity (simple to complex).
    4. Scope and patterns of sequence.

Appendix C

C. The Reading Process. Flexible reading involves:

   1. Establishing reading purposes.
   2. Assessing reading material.
   3. Organizing a reading plan (selecting speeds for reading, etc.).
   4. Evaluating performance.
   5. Adjusting reading plan.

II. Attitudes are the acceptance of the knowledges and understandings of the content of the training program. Attitudes to be developed include:

   A. Acceptance of the value of flexible reading speed.
   B. Acceptance of the need for variation in speed of reading:

      1. Between selections.
      2. Within one selection.

   C. Acceptance of the idea that reading performance can be improved.

III. Skills are the processes or operations the pupils need to use to achieve flexible reading--the "how" or method to be used to implement concepts. Skills to be developed include:

   A. Recognition of internal (author's) or external (assigned or child's) purposes.
   B. Determination of the relative difficulty of material for the individual pupil through the use of such criteria as:

      1. Previous knowledge of content.
      2. Vocabulary.
      3. Complexity of sentence structure.
      4. Style.
      5. Paragraph structure.
      6. Pupil interest.
      7. Physical characteristics of the material (length, size of print, paragraphing).
      8. Level of abstraction.

   C. Formulation and recall of the sequence, level, and/or relationship of ideas; for example:

      1. Chronological order.
      2. Cause and effect relationship.
      3. Simple to complex level.
      4. Concrete to abstract level.
      5. Parallelism of ideas.
      6. Compatability of ideas.

Appendix C

D. Synthesis and evaluation of ideational units to determine main idea:

    1. Identification of stated main idea.
    2. Statement of inferred main idea.

E. Selection of reading speed according to assessment of purpose and materials.
F. Evaluation of adjustment of reading speed.

APPENDIX D

SAMPLE OF PRACTICE SELECTION

Sample
MI

The selection on the next page is about

Mr. Potts

You are to read this selection once for this purpose:

to find the most important or main idea.

When you are through reading the selection once, you should raise your hand. Then you will be shown a list of sentences telling about the selection. These sentences will be in a mixed-up order. You will be asked to pick out the most important idea from this list and mark it with an X.

If you don't know a word, raise your hand and we will help you.

Remember, you are to read the selection once,

to find the most important or main idea.

Turn the page.

Appendix D

Sample
MI

Mr. Potts was getting ready for a trip. This morning Mr. Potts drove to the bank for extra money. On the way home he stopped to fill the gas tank. Next he packed two suitcases. He put the suitcases in the car.

Raise your hand.

Do not re-read.

Appendix D

Sample
MI

The sentences below tell about what you have just read. The sentences are in a mixed-up order. You are to find the most important or main idea.

1. Look at the five sentences below.
2. Mark one sentence with an X to show the main idea.

_____ The suitcases were put in the car.

_____ He filled the gas tank.

_____ Mr. Potts was preparing for a trip.

_____ He went to the bank.

_____ Mr. Potts packed his suitcases.

APPENDIX E

LIST OF TRAINING SELECTIONS ACCORDING TO READING PURPOSE MADE AVAILABLE TO SELF-SELECTION GROUP

TRAINING SELECTIONS

	Sequence		Main Idea		Specific Fact
3	Glaciers	41	The Moon	84	Going Fishing
4	Preparing for a Trip	46	Bears	86	Down in the Earth
7	The New Highway	47	Plants	88	Going to Market
9	Leaders	50	Animal Visitors	90	Chinese Junks
14	The Mystery	54	Bees	94	Robert E. Lee
15	Wild Horses	55	Rocks	95	The Raft
16	The Hunters	56	The Boxer	96	Glass
17	The Thunderstorm	57	Animal Hearing	97	Italian Villages
18	Pancakes	58	Ocean Trip	98	The Camp
19	A Lightning Adventure	59	The Bear	99	A Flatboat Trip
20	Saving the Fort	60	Pets	100	Forest Fire
21	Lewis and Clark	61	The Streamlined Train	101	A Dwarf
22	Catching Gophers	62	Baby Lion	102	Lincoln Land
23	The Hike	63	Philadelphia	103	Fresh Foods
24	Foresters	64	Busy Badgers	104	Early Light
25	The Delicious Dessert	65	Skunks	105	Italian Farmers
26	Purple Cows	66	Rosebushes	106	Carlsbad Caverns
27	The First Paper	67	Walking	107	Camping
28	Making Canoes	68	Helicopters	108	The World's Fair
29	Salmon	69	White Man and Indians	109	Yellowstone Park
30	Making Paper	70	Franklin	110	The Brown Family
31	Setting Type	71	The Fox	111	The Penguin
32	A Game	72	The Crow	112	Stormy Seas
33	Writing Sticks	73	Hush Puppies	113	Homework
34	The Cricket	74	Marco and His Donkey	114	The Elephant

APPENDIX F

EXAMINER DIRECTIONS FOR THE FIRST FOUR DAYS OF THE TRAINING PROGRAM

First Day

(Examiners: Before students arrive, check order of selections for each child against headings on child's answer sheet to be sure they are the same.)

I am ____________________ ____________________. (Write name on board.) This is ____________________ and ____________________ (introduce others.) We will be meeting with you each day for the next two weeks, so we will need to know your names. Will you tell us your name? (Indicate one child, the next, etc.)

As we told you earlier, we want you to help us find out more about how we read. What you do will not be reported to your teachers or used for your report card. But we hope you will all do your best to help us.

For the next 2 weeks you will be reading many selections. We would like to have a record of your reading time. So today you are going to learn how to tell time on a new kind of watch called a stop watch. [Detailed directions for learning to use stop watches were then given.]

Here is a Time Record sheet on which you will write down your reading times. (Hand out Time Record sheet.) Let's practice using it now. [Further practice in timing and recording was then given.]

You are going to use watches and Time Record sheets like this to keep a record of the time it takes you to read a selection. (Give each child a set of the first three selections.)

Here are three selections. Let's read the directions for the first one together. (Read aloud.) Look at your watch. Do the hands point up? Be sure to check this each time before you start reading a new selection. It is very important that your watch is ready for use before you begin to read. (Continue reading the directions.) You are to read this selection once for this purpose: To find the most important or main idea. What do you look for when you read to find the main idea? (Children answer.) You look for the one sentence that tells you most about the whole selection. The main idea can be found any place in the selection. (Continue reading the directions.) If you don't know a word, raise your hand and we will help you. Remember, you are to read the selection once to find the most important or main idea. Before you turn the page, let me explain. It will say at the top of the next page: "Start your watch." As soon as you have finished reading the selection once, stop your watch. Do you understand? Good. Now, turn the page and follow the directions. (When all children have finished and stopped watches, examiner reads aloud the directions at the top of the third page.) Then, do what the directions have asked you to do. (Wait until this has been done. Examiners check.)

(Continue reading the directions.) Record your time on the Time Record sheet. We have used the first column for practice. Put your reading time on the first blank in the second column. Notice that the number of the story you just read is written at the top of the column.

Some of you were able to find the main idea after one reading. (Examiners give these children books to look at.) Because we want everyone to find the main idea, the rest of you will have a chance to read again. (Examiners should number a second answer sheet, place it on top of the first answer sheet and then place the selection and direction sheets on top of the new answer sheet.) Re-read the purpose which is at the bottom of the direction sheet. Now, you are going to do exactly what you did when you read this selection the first time. (Pupils should work independently, time themselves, read the selection, do the answer sheet and record their time. Examiners should check the answers, the time recorded, and clear the watch.)

Now, read the directions for the next selection. When you have read the directions carefully, you may go ahead and do the work. (Examiners should be sure the watches are cleared and ready for use before the pupils read. Pupils may go ahead and repeat the procedure for the third selection.)

Today, you learned to use stop watches and Time Record sheets to keep a record of your reading time when you read for three different purposes. What were the three purposes? What does it mean to read for these three purposes? (Discuss and have pupils redefine purposes.)

Tomorrow, you will be given a graph on which you can record your reading time each day. This graph will help you know how fast you read for each of the purposes we talked about today. Before tomorrow, think about this question: Does your purpose for reading make a difference in your rate or speed of reading? Tomorrow we will talk about this question.

Appendix F

Second Day

(Examiners: Write numbers of selections for the day on the top of the columns on the Time Record sheet. After a child finishes reading a selection, transfer the number of words in red pencil for the selection from the answer key to the Time Record sheet immediately below the space for total seconds.)

Think about the three purposes for which you read yesterday. What were those three purposes? (Children answer.)

Yesterday we asked you to think about the question: Does your purpose for reading make a difference in your rate or speed of reading? What did you decide? (Pause for answers.) Why?

Knowing your purpose can help you plan what you are going to do. How should you read when you are asked to find just one specific fact, e.g., What color car did Mother want? (Pause.) Yes, very quickly. What can you do when you have found that fact? Yes, you can stop reading because you have accomplished your purpose.

What do you do when you read to find the main idea? (Pause.) Yes, you look for the sentence which tells the most of what the whole story is about. If you are reading to find the main idea, you will find that you can read the other parts of the selection more rapidly.

What do you do when you read to remember the order in which things happen? (Pause.) You remember what happens first in the selection, what happens next, what happens after that, and so on.

Should you read at the same speed for all three purposes? For which purpose do you think you would read fastest? (Pause.) slowest? (Pause.) Do you know why we asked you to keep a record of your reading time? (Pause.) Yes, but we are not interested in just how fast you read; we want you to learn to adjust your reading speed to different purposes. We believe you will be better readers if you learn to do this.

Today you are going to read three more selections. We want you to think about your purpose for reading each selection. Then try to find your best reading speed for that purpose.

Turn to the first selection. Read the directions carefully. Then start your watches, read for the right purpose, and stop your watches. Do the answer sheet, record your time, and raise you hands to have your answers corrected and your watches checked. Do not clear your watches after you stop reading. When you finish reading and re-reading until you have the right answer, wait until everyone has finished. Ready? Begin reading the directions. (Examiners check carefully to be sure pupils follow directions. Check starting of watches, stopping of watches, recording of time, etc. Provide pupils who finish early with books.)

You will need to keep a record so that you can see how much you are adjusting your reading speed to different purposes. Here is a table to show you how many words you read per minute. (Hand out Conversion Table.) It is called a Conversion Table.

Look at the headings of the columns. The first heading says Time in Seconds. This means the number of seconds it takes you to read a selection. Look at your Time Record sheet. How many seconds did it take you to find the main idea? Slide your finger down the first column in the Conversion Table until you reach that number.

Now, look at the numbers at the top of the other columns. Those numbers tell you how many words there are in a selection. On your daily Time Record sheet, look at the red number underneath the number for Total Seconds. This is the number of words in the story you just read. Slide your finger across the Conversion Table until it is in the column headed by that number, 62. Your finger will then be under the number of words you would have read if you had read at the same rate for exactly one minute. Write this number on your Time Record sheet in the last space of the first column. (Examiner, watch carefully that each child finds correct number.)

Let's practice finding a few more words per minute scores. [Further practice in timing and in using Conversion Table was given.]

(When all have finished reading, hand out graphs and colored pencils.)

Now you will record your words per minute scores on these graphs. The numbers on the left side of the graph indicate words per minute. The numbers across the bottom of the graph will be the numbers of each of the selections you will read. These are written in on your graphs today. Later, some of you will need to write them in. We will always use a red pencil to record scores of all selections read for the main idea.

Look at your daily Time Record sheet. In how many words per minute did you read the first selection? Put a red dot on the graph to show this number. Mark it lightly at first. When it has been checked, mark it clearly.

We will always use a blue pencil to record scores of selections read to remember the order in which things happened. In how many words per minute did you read the second selection? Put a blue dot on the graph to show this number. Mark it lightly. Have it checked, then mark it clearly.

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We will always use a green pencil to mark scores for specific fact. In how many words per minute did you read the third selection? Put a green dot on the graph to show this number.

Look at your graphs. On how many graphs is the red dot highest? the blue dot? the green dot? If the green dot is highest, this means that you read fastest to find one specific fact. Tomorrow you will use these graphs again to do two things: first, to plan how fast you will read the next selection for each purpose, and second, to record the words per minute for each selection. Your graphs will tell you how much you are adjusting your reading speed to your purpose.

Appendix F

Third Day

Yesterday you recorded your reading time on a graph. Let's take a look at the graphs. What does the blue dot mean? the red dot? the green dot?

Now you are going to read three more selections. You will read the first selection to find the main idea. But today you have something new to do. Read your direction sheet. (Pause.) What is the new direction? (Call on someone to read it.) Put a red X on the graph to show how fast you plan to read this selection.)

We want you to decide how fast you plan to read a new selection. To do this, you should do three things: first, look at what the selection is about; second, look at the purpose for which you will read; and third, look on your graph to see how fast you read the last selection for the same purpose. Remember: Think about how fast you read last time for this purpose, what the purpose is, and what the selection is about. Now decide how fast you plan to read this selection and put a red X on the graph to show how fast you plan to read this selection.

Some of you may plan to read faster; some may plan to read slower. Each one of you must plan for himself. (Pause.) We want you to learn to plan how fast you will read each new selection. This will help you understand better how fast you actually do read. It will also help you discover that you can read at different rates for different purposes. (Check that all make prediction.)

Have you checked your watch? Remember to start it when you begin to read and to stop it when you finish. Then you can go on to your answer sheet. When you finish that, record your time, and have your answer sheet checked. Re-read if necessary. Then use your Conversion Tables to get the right answer, because you have not finished your reading task until you have accomplished your purpose for reading. When you finish, wait for the others. Now finish reading your direction sheet and begin work. Ready? Begin.

(Pupils do first selection. Check comprehension, time recordings, and clear watch. If 100 per cent has not been achieved, give student new answer sheet and have him read directions, re-read selection, do comprehension check, and record time for reading selection again. Offer any help necessary for conversion of reading time to rate via Conversion Table. Complete Time Record sheet.)

(When all have finished.) Now take the words per minute score and put a red dot on the second line of your graph to show this score--your reading rate. Draw a line to connect it with yesterday's red dot. If the dot is higher today than yesterday, you read faster today. How many read faster? How many read slower? Look at the red X. How many

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planned to read faster? slower? about the same? If the red dot for today is near the red X, you are learning to read as you planned.

Now we are going to read another selection to remember the order in which things happen. When you get to the new direction, stop. (Pause until pupils read to that place.) Now look at the name of your story. Look at your purpose. Now look at the blue dot which shows yesterday's score for this purpose on your graph. Plan how you will read for this purpose today. Now, do what the new direction says: Put a blue X on the graph to show how fast you plan to read this selection. Then continue reading your directions and go on with your work as before.

(When all have finished.) Now take the words per minute score and put a blue dot on the second line of your graph to show this score. Draw a line to connect it with yesterday's blue dot. How many read faster? slower? as you planned? If the blue dot is near the blue X, you are learning to read as you planned.

Now we are going to read another selection to find a specific fact. The "specific fact" is what you need to find to answer the question. When you get to the new direction, stop. (Pause.) Look at the name of your story and then at your purpose. Look at the green dot for yesterday's score for this purpose on your graph. Now decide how fast you plan to read this selection. Put a green X on the graph to show how fast you plan to read this selection. Then continue reading directions and go on with your work.

(When all have finished.) Do you have any questions about the directions? (Pause.) the Conversion Table? (Pause.) the graph? (Pause.) anything else? (Pause.) Good!

Now you have learned how to read directions, to plan how fast you will read, to time yourselves, and to record how fast you did read. Tomorrow and the next few days we will ask you to read more selections exactly as we have shown you today. You will work in pairs just as you have been doing, but you may be reading different selections. Some of you will have the numbers of your selections on your graphs and some of you will need to write them in. You will find out about that tomorrow. Remember, we want you to try to make your reading speed fit your purpose. This will help you become a better reader.

Each day when you are through reading, we also want you to tell us very simply what you think or feel about your reading. (Hand out inventory sheets.) Let's make out one of these sheets called How Much? for today. Put your name and the date at the top. The directions say "Put an X on each line to show what you think or feel." Look at question 1. "Did you enjoy your work today?" Put an X somewhere on the line to show how you feel. If you enjoyed it very much or a lot, put the X over here near the words very much. (Demonstrate.) If you didn't enjoy your work, put the X somewhere over there near the words very little. (Demonstrate.) If you feel it should be somewhere in between very little and very much, put the X somewhere in between the two. (Demonstrate.) Is that clear?

Now do the same for each of the other questions. (Read them with pupils, pausing for them to answer.)

Do any of you have any questions? (Pause.)

We'll see you tomorrow.

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Fourth Day

Today you are going to read six selections. Before you read each selection, you will follow directions and mark your graphs to show your plan for reading. Then you will finish reading directions. Remember to start your watches, and stop your watches at the right times. Be sure to have your teacher check after you record your time before your watch is cleared. Do any of you have any questions? Then you are ready to start.

(All examiners except those whose pupils have self-selection will put six selections in a pile before pupil and say:) These are the selections you will read today. If you have no questions, you may start as soon as you are ready. (Check all steps very carefully.)

Directions for Self-Selection Groups only:

Beginning today, you will have a chance to choose the selections which you will read. In that box (point) are all of the selections numbered in order.

Look at your graph and decide for what purpose you wish to read your next story. (Let children do this.) Then look at the Selection List. (Distribute.) Find the column for the purpose for which you wish to read.

1. Choose a selection for that purpose.

2. Put a circle around the number of the selection.

3. Get that selection from the box.

4. Put the number of the selection on the Time Record sheet.

5. Read the yellow direction sheet and do what it tells you to do.

6. When you finish, study your graph and decide on the purposes for your next selection.

APPENDIX G

PRE-TEST SELECTIONS

Pre A
MI/N

The selection on the next page is about

A Mountain Lion

You are to read this selection once for this purpose:

to find the most important or main idea.

When you are through reading the selection once, you should raise your hand. Then you will be shown a list of sentences telling about the selection. These sentences will be in a mixed-up order. You will be asked to pick out the most important idea from this list and mark it with an X.

If you don't know a word, raise your hand and we will help you.

Remember, you are to read the selection once:

to find the most important or main idea.

Turn the page.

Pre A

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MI / N

Sheba came down from her mountain home seeking food. She had traveled far and was tired and hungry. She was not very old but she was crippled. Long ago she had jerked one hind paw free from a trap. The paw healed, but she could never again jump so quickly or so far. Crippled Sheba could no longer catch and kill wild animals for her food.

Raise your hand.

Do not re-read.

Pre A

Appendix G

MI / N

The sentences below tell about what you have just read. The sentences are in a mixed-up order. You are to find the most important or main idea.

1. Look at the sentences below.
2. Mark one sentence with an X to show the main idea.

_______ She had caught a paw in a trap.

_______ She was crippled but not old.

_______ She could not jump well.

_______ Sheba could no longer kill wild animals for food.

_______ Sheba left her mountain home.

_______ She was tired and hungry from travel.

Raise your hand.

Pre B
F/N

Appendix G

The selection on the next page is about

The Ice Surprise

You are to read the selection to answer this question:

What did the boy throw into the hole in the ice?

When you find the answer to the question, stop and raise your hand. Then you will be shown a list of sentences telling about the selection. These sentences will be in a mixed-up order. You will be asked to pick out the answer from this list and mark it with an X.

If you don't know a word, raise your hand and we will help you.

Remember, you are to read the selection once to answer this question:

What did the boy throw into the hole in the ice?

Turn the page.

Appendix G

Pre B
F/N

Some boys took their new visitor ice skating on a frozen lake in Kansas. They thought it would be fun to surprise him. So they chopped a small hole in the ice. A boy lit a match and threw it into the hole. A fire started in the water in the hole in the ice. The bright blaze was hot enough to dry their mittens.

Raise your hand.

Do not re-read.

Appendix G

Pre B
F/N

You are to find the answer to the question below.

1. Read the question.

2. Mark the answer with an X.

Question: What did the boy throw into the hole in the ice?

_______water

_______chopped ice

_______their new visitor

_______a surprise

_______mittens

_______a burning match

Raise your hand.

Pre C
F/E

Appendix G

The selection on the next page is about

Indian Life

You are to read this selection to answer this question:

What did Indians leave in the cave many years later?

When you find the answer to the question, stop and raise your hand. Then you will be shown a list of sentences telling about the selection. These sentences will be in a mixed-up order. You will be asked to pick out the answer to the question from this list and mark it with an X.

If you don't know a word, raise your hand and we will help you.

Remember, you are to read the selection to find the answer to this question: What did Indians leave in the cave many years later?

Turn the page.

Appendix G

Pre C
F/E

Early Indians who lived in caves often moved from one cave to another. Sometimes they left worn tools and baskets in their old cave. As the years passed, dust and dirt buried everything. Years later, other Indians living in this cave would leave clay pots behind them. These, too, would be covered with dust. By digging into these caves, we learn much about early Indian Life.

Raise your hand.

Do not re-read.

Appendix G

Pre C
F/E

You are to find the answer to the question below.

1. Read the question.

2. Mark the answer with an X.

Question: What did Indians leave in the cave many years later?

________dust and dirt

________clay pots

________things they dug up

________a larger cave

________covered things

________worn tools and baskets

Raise your hand.

Appendix G

Pre D
S/N

The selection on the next page is about

Trapping

You are to read this selection once for this purpose:

to remember the order in which things happen.

When you are through reading the selection once, you should raise your hand. Then you will be shown a list of sentences telling about the selection. The main idea will be marked for you. You will be asked to number the sentences in the right order.

If you don't know a word, raise your hand and we will help you.

Remember, you are to read the selection once:

to remember the order in which things happen.

Turn the page.

Appendix G

Pre D
S/N

Two young men bought oxen and trapping supplies and started out west. They went to the Pine River where they had heard there were many animals. They built a small log cabin for shelter. They made a stone fireplace in one corner for warmth and cooking. Then they built a pen for the oxen. Young Buffalo Bill and his friend were now ready to trap animals.

Raise your hand.

Do not re-read.

Pre D
S/N

Appendix G

The sentences below tell about what you have just read. The sentences are in a mixed-up order. You are to put them in the right order.

1. Read the sentence called Main Idea.
2. Put the sentences under the main idea in the right order as they happened. Number the right order 1, 2, 3, 4, 5.

Main Idea: Young Buffalo Bill and his friend were now ready to trap animals.

________For shelter they built a log cabin.

________They bought trapping supplies.

________A pen was built for the oxen.

________The fireplace was built for heat and cooking.

________They went to the Pine River.

Raise your hand.

Appendix C

Pre E
MI/E

The selection on the next page is about

The Camel

You are to read this selection once for this purpose:

to find the most important or main idea.

When you are through reading the selection once, you should raise your hand. Then you will be shown a list of sentences telling about the selection. These sentences will be in a mixed-up order. You will be asked to pick out the most important idea from this list and mark it with an X.

If you don't know a word, raise your hand and we will help you.

Remember, you are to read the selection once:

to find the most important or main idea.

Turn the page.

Appendix G

Pre E
MI/E

There is not enough food or water in the desert for most animals. When the camel drinks, he stores extra water in his stomach. He uses this water later when it is needed. The fat in his hump is used as extra food. The camel seldom needs to stop for food and drink. The camel travels farther without needing food and water than other desert animals.

Raise your hand.

Do not re-read.

Appendix G

Pre E
MI/E

The sentences below tell about what you have just read. The sentences are in a mixed-up order. You are to find the most important or main idea.

1. Look at the six sentences below.
2. Mark one sentence with an X to show the main idea.

_____ Fat in the camel's hump is extra food.

_____ The camel uses stored water when needed.

_____ Camels go farther than other animals without needing food and water.

_____ Deserts have little food and water.

_____ The camel seldom stops for food and water.

_____ The camel stores extra water.

Raise your hand.

Pre F
S/E

Appendix G

The selection on the next page is about

Stories in the Rocks

You are to read this selection once for this purpose:

to remember the order in which things happen.

When you are through reading the selection once, you should raise your hand. Then you will be shown a list of sentences telling about the selection. These sentences will be in a mixed-up order. The main idea will be marked for you. You will be asked to number the sentences in the right order.

If you don't know a word, raise your hand and we will help you.

Remember, you are to read the selection once,

to remember the order in which things happen.

Turn the page.

Appendix G

Pre F
S/E

Years ago rivers carried many kinds of material into the oceans. This material piled up in deep layers on the ocean floor. The heavy layers gradually pressed the material on the bottom into rock. Bodies of dead sea animals also fell to the ocean bottom. Their skeletons, too, became part of the rock. Such clues in rocks tell us much about the earth of long ago.

Raise your hand.

Do not re-read.

Pre F
S/E

Appendix G

The sentences below tell about what you have just read. The sentences are in a mixed-up order. You are to put them in the right order.

1. Read the sentence called Main Idea.
2. Put the sentences under the main idea in the right order as they happened. Number the right order 1, 2, 3, 4, 5.

Main Idea: Clues in rocks tell us about the earth as it was long ago.

________Skeletons became part of the rock.

________Rivers brought material to the ocean.

________Material was pressed into rock on the ocean bottom.

________Bodies of sea animals fell to the ocean bottom.

________Material piled upon the ocean floor.

Raise your hand.